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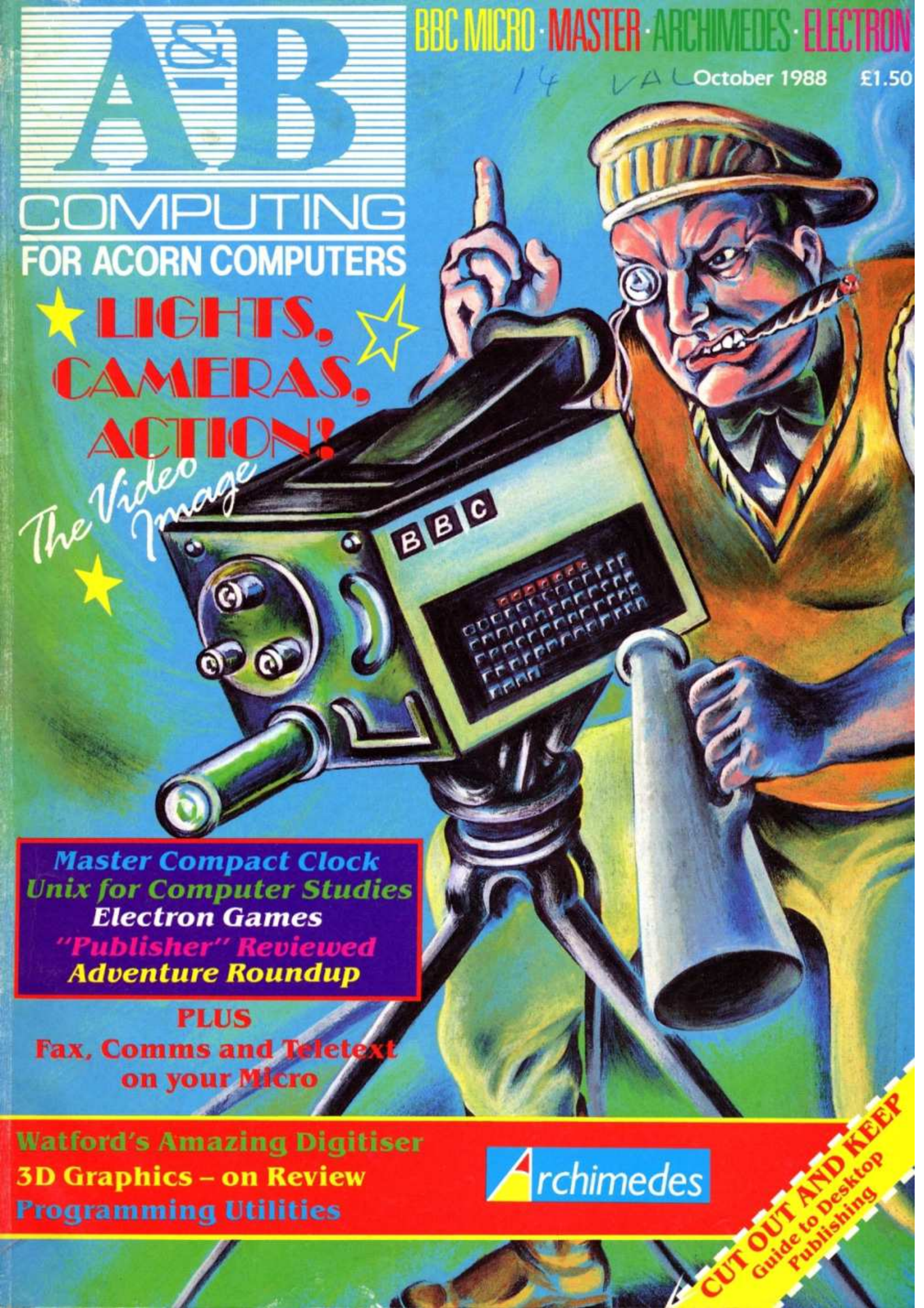

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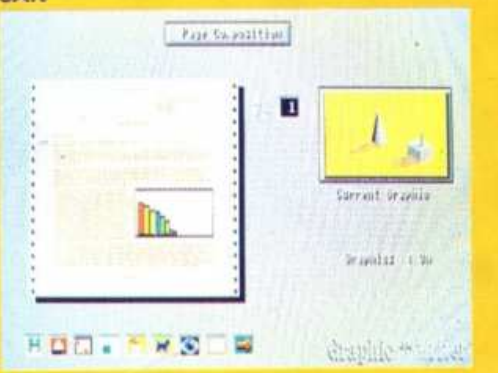

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FAX PACK FOR THE ARCHIMEDES

The Computer Concepts FAX PACK adds the power of the Archimedes computer to a FAX machine. It includes the following features:

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- Auto-dial allows other computers or FAX machines to be dialled by the computer. Either a phone number or a name can be specified. Names are looked up in a phone number directory file to obtain the correct number.
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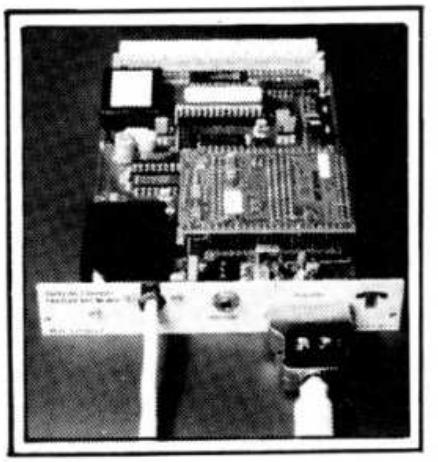

The popularity of FAX machines has increased to such an extent during the last twelve months that they now outnumber TELEX machines. In today's successful business, a FAX machine is as vital a piece of office equipment as a telephone.

- The software automatically detects the type and group of machine dialled. It can also detect a suitably FAX equipped computer. If it other end, similar to this computer, then it can avoid the FAX protocols and transmit the files, error checked, directly to the remote machine.
- Auto dial and auto-answer hardware which sends or receives any group 3 FAX, and saves on the current filing system as a suitable FAX file.

Most facilities are available from simple logical star commands, such as *DIAL Fred and *SendFAX file office.

FAX PACK INCLUDES:
the FAX podule for plugging into any Archimedes computer, (fitted with a back-plane) and software as described above.
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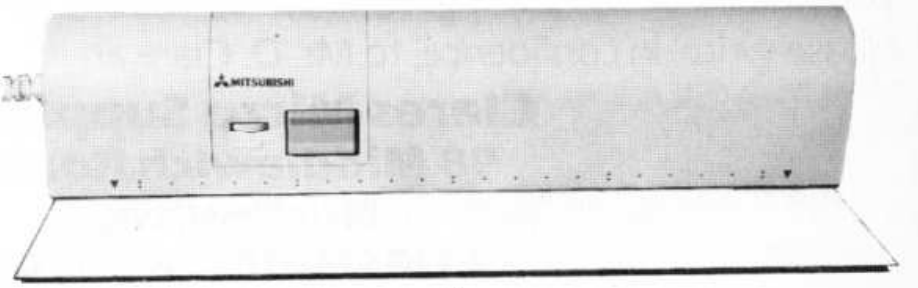

- Since FAX modems work at 9600 bits-per-second, this allows direct file transfer at least 4 times as fast as the fastest conventional modems. Indeed any file can be automatically sent, **or obtained** from a remote machine.

Price: £499 plus VAT or £799 plus VAT with the scanner.

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A&B COMPUTING

Volume Five Number Ten October 1988

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Design Council Award Prizes For Boxes!

And why not? The Tate Gallery paid perfectly good money for a stack of bricks a few years ago, so why not award prizes to computer software packaging irrespective of the quality of the software *inside* the beautiful packaging?

I can think of a lot of reasons why.

First of all, the awards were doled out irrespective of the quality of the software packages on offer – this was strictly for the packaging bozos and no mention was made of the pricing of the software packages, and how much cheaper the software would have been without all the surplus paper and cardboard being thrown in for good measure.

So the next time you buy a massive cardboard box for a lot of money with just a flimsy manual and a disc inside it, you know where the mentality lies okay? As an example you may remember a stupid software package called *The Great Space Race*- a hunk of cardboard with nought else bar a cassette and a lot of air.

On to the good news however, ESM were at The Design Council presentation ceremony for the most innovative solution to the "problems" (their word not ours) of computer packaging.

Should you own a legal copy of this ROM, you will no doubt be aware of the pretty nifty packaging supplied with the ROM where the manual *becomes* the packaging! All is well and good with the universe by at large – but does this sort of innovation (the only one at the ceremony) *really* necessitate an awards ceremony – full of fatuous speeches, factually incorrect comments about the industry, and backhanded comments about **you** the software buying public?

The buffet was nice, but I feel something is amiss – after all when buying computer software (other than games software), the packaging is often secondary – ESM's Screenprint ROM arrived at A&B a long time ago with a piece of paper for the manual and a single ROM chip on a piece of antistatic foam.

The fact is that Screenprint is *still* the best screen dump program I have ever seen, without the need for all this stupid ceremonialising and ritual, false smiles and so on...

Computer users want good software and equipment, not pretty boxes, but nevertheless, it is as good a reason to plug ESM's screenprint ROM as any.

● **Contact: ESM Limited, 32 Bridge Street, Cambridge, CB2 1UJ. ☎ (0223) 65445.**

Gnome Sweet Gnome

By Darrin Williamson

Recognise sweet thing? no it's not Clive getting ready for one of his wild Oxford parties, (hah! – ill for a day and see what the upstart writes about me! – Clive) it is in fact none other than *Ingrid* who first appeared in the Level 9 Adventure *Gnome Ranger*.

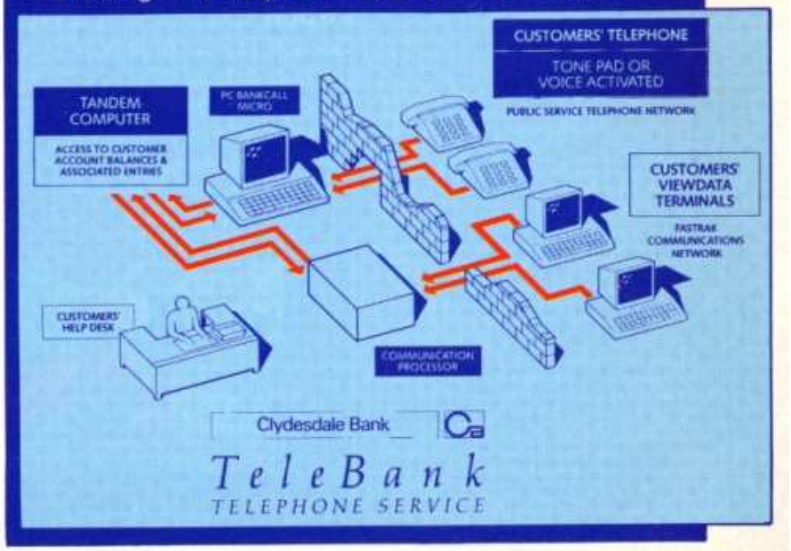
Well the little cherub is back in a game innovatively titled *Gnome II: Ingrid's back*.

The game will get its first airing at the Personal Computer Show in mid September and should go on sale in October.

ACORN NEWS

Bank with your Beeb

A rather nice new telebanking service has emerged from the Clydeside Bank. Telebank allows its customers access to their bank account via any old viewdata terminal. Not only does it let you to check on your account but it also allows you to pay bills to people you have pre-specified. Not only can you use your terminal to do all this but you can also use any telephone with DTMF tone capability to access the system. In short subscribing to this service (which is free incidently) means that you don't have to make nearly as many trips down to your local branch. The diagram shows just how the system works. A&B's Communications correspondant David Janda has got himself a Clydesdale account and will be reporting on his findings in a couple on months time. Stay tuned.



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AB 9

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This is just a small sample of the items featured in Volume 6

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- Archimedes (Acorn launch)
- Overview of Computer Education
- C Programming
- Now C Here (Part 1)
- Comms Problems
- Intelligent Modems
- Exploring Assembler
- Introduction to Assembly Language
- Animation
- Colouring your Beeb Pt.2
- Sideways and Shadow RAM
- Animation (Trench)
- Giant Bounce
- Giant Scroller

60 In Depth Editorial Features

PROGRAMS : Applications

- Chart Recorder
- Circuit Analysis
- Ghost Host (Bulletin Board)
- Keystrip Generator
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- Printing and Transposi…
- Resistor Calculation…
- Video Cassette Cataloguer Pt.1
- World by Night and Day

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REVIEWS : Books

- Books for Serious Users
- Master Operating Sys. (DABS Press)
- The New Advanced User Guide (Adder)
- Books for View
- A Dabhand Guide (DABS Press)
- Mastering View (Sigma Press)
- Computing without Programming
- The C Programming Language
- The Recursive Universe

The latest News from Acorn and other major suppliers.

REVIEWS : Software

- InterBase (Computer Concepts)
- Master Emulation ROM (DABS Press)
- PCB Autoroute (Pineapple Software)
- PrintROM (Windmill Software)
- Realtime Solids (Silicon Vision)
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- Word Power (Ian Copestake Software)
- ADU ROM (Pineapple Software)
- Acornsoft C (Acorn Computers)
- Diagram II (Pineapple Software)
- Fontaid (CJE Micros)
- Genie (PMS)

PROGRAMS : Utilities

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- Animated Titling
- DFS Utilities: *FREE and *MAP
- Epson Character Definer
- Function Keys
- IBM to BBC Transfer Utility Pt.1
- MIDAS Universal Disc Front End
- Machine Code Cross Referencer
- Mode 7 Menu Generator
- Overlaying Techniques
- Procedure and Function Analyser
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- Music 400 (Hybrid Technology Ltd)
- Pearl 8000 Data Logger (Innovations)
- Quest Mouse (Watford Electronics)
- Real Time Clock (Solidisk)
- Z88 (Cambridge Computers)
- Archimedes A440 (Acorn)
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Let's go to the Zoo

The climax of the World Wide Wide Fund/Citizen schools project competition was held at Londons Regents Park Zoo recently. Representitives from all the winning schools were there to collect their nice new printers along with the top dogs from both Citizen and the World Wide Fund for Nature (formally the World Wildlife Fund). Apparently the name was changed because it was "wild life" was too easily misinterpreted to mean wild living in other countries.

The competition involved schools from all over the country putting together conservation projects using a micro and a printer. Hundreds of schools submitted entries which were judged by a celebrity panel of judges including Rula Lenska (actress), George Layton (comedy actor/writer) and Ruth Lawrence (smart alec who passed her maths degree at the age of 13).

The primary school category was won by the Northfield School in Watford with their project on the dental health of the girls in the school.

The secondary school category was won by the Gosforth Middle School with their project on trampling the grass around the school.

Both schools recieved £2000 computer vouchers whilst the runners up recieved Citizen 120D printers.

Epson upgrade paper handling of printer

Some people would call it "improving" others would happily welcome Epsons decision to support the FX range of printers' decidedly awful paper handling facilities by offering an expansion option enabling simultaneous cut-sheet and continuous paper handling facilities (a feature already welcomed on the 24 pin LQ printers) for the Epson FX850 and the FX1050.

There is no need to manually change paper feeders when a change is required from single sheets to continuous paper and Epson's claims thate the feeder will hold four part paper and park it prior to being properly loaded seems to be almost too good too be true.

The printing speed of these printers has also been vastly upgraded – Draft print speeds are 10% faster the previous models reaching 264 CPS and NLQ print is improved from 48 CPS to 54 CPS, it is also claimed to be quieter.

The *real* news from Epson (casually added at the end of their press release) is that there is no price increase which will be welcomed as it seems that Epson are absorbing the blow regarding the European Commission's descision to slap a levy on all Japanese printers using components sourced in Japan and not – as the EC hope, from the EEC.

Micros in the Classroom – in book form!

In an unreserved plug for Chris Drage and Nick Evans, two colleagues and writers for A&B Computing, I have the very great pleasure in informing you all of a new book the dynamic duo have written specifically for teachers. Called **Teacher Friendly – A Guide to using Micros in the Classroom**, their 260 page book takes the experienced and the not so experienced through Microcomputer technology into the classroom – and when I say Microcomputer Technology, you can bet I mean the BBC Micro.

Written in good old plain English, this book shows you just how useful the Micro can be, it is a shame, but some schools have their Micros shoved into the corner of a room out of the way because teachers have been unable to find decent software – not any more! There are reviews, comments, tips and even a list of 900 useful addresses.

The book will be available on the 24th of October and I strongly recommend this book after browsing over the rough drafts – yes this is a plug for a couple of mates, but it is a damn good read as well!

● **Contact: Denis Blackmore, LDA. 32 Bridge Street, Cambridge, CB2 1UJ. ☎ (0223) 357744.**

See you in Rotterdam!

Last year, A&B Computing visited Rotterdam and met a bunch of enthusiasts at *The Big Ben Club*, the Netherlands' very own Acorn user group. This year there will be plenty of British Exhibitors such as, ahem, our good selves, DABs press and a number of "special" visitors (we're not even sure who they are!).

Plans are still being roughed out at the moment but next month I hope to have something more concerete, but for the time being contact the Big Ben Club's organisers at:

● **Contact: Harry A Linsen, Gommerskerspel 24, 2151 RA Nieuw Vennep, Netherlands. ☎ (31)2526 72385. You can EMAIL them on 27:NPS583 or Telex them on Netherlands 20000 and MMC NPS583 on the first line.**

Logo Resource Materials

Logotron have a number of Logo support materials available to provide ideas for teachers or parents.

The "Walsall Papers" cover Talking Turtles, Islamic Patterns, Playing Floor Turtle (Valiant and Jessop) and In Control with Logo. All are priced at £6.00 or £20.00 for the set. An audiotape with interviews with LEA advisers, teachers and Logotron staff is available for £3.80.

● **Details: ☎ 0223 323656.**

Desktop Diary

14-18 September – Personal Computer Show. This year held at Earls Court. Come and visit Acorn Computers and A&B Computing (Disk User will also be there).

25th September – A&B/Watford Electronics Open Day. Meet the stars of A&B Editorial and see some of the best hardware and software around for the Beeb, the Arc and the Z88. DON'T MISS IT!!!

30th September-9th October – BBC Radio Show. Earls Court celebration of 21 years of Radios 1,2,3 and 4.

October 10 Big Ben club show.

October 11-13– Computer Graphics '88. Professional show at Wembley Conference Centre.

13-15 October – Desktop PubLishing Show. All types of micro. Business Design Centre, London.

11-13 November – Electron and BBC Micro Show. New Horticultural Halls time again. The fabulous Sue (who? – Clive) will be on hand at the A&B stand. Presumably the show will be chock full of super-cheap disk, printer paper/stands, monitors, etc, etc.

17 November 1988 – Into the Future with ESG. Organised by RESOURCE, aims to explore how the Government's Education Support Grant is taking effect. Speakers from NCET, DES, TVEI and LEAs. Also discussed will be the impact of 16 and 32 bit computing. **Contact** Anne Swainston or Kevin Smith, RESOURCE, Exeter Road, off Coventry Grove, Doncaster DN2 4PY. ☎ 0302 63800/63784.

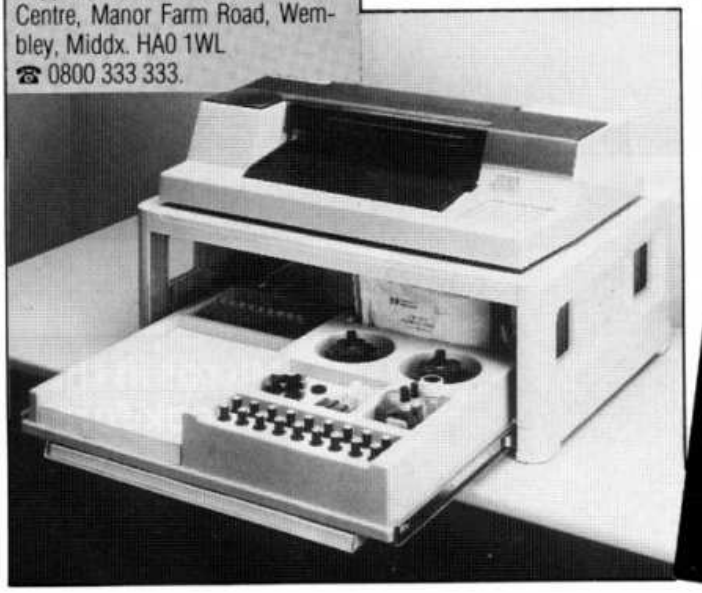
Useful Product from ACS!

Our "incredible but true" department uncovered a little item from Action Computer Supplies that actually looks vaguely useful.

If you've got a plotter you may well have been stuck for somewhere to stick your spare pens, paper, inks and cleaning equipment. Problem solved, what you "need" (their word not ours) is the ACS Micro Manager desktop plotter stand which comes complete with a "convenient storage tray" for the aformentioned items.

The price for all of this is £109 which may seem like a lot of money, but that may be because it is.

● Contact Action Computer Supplies at Abercorn Commercial Centre, Manor Farm Road, Wembley, Middx. HA0 1WL ☎ 0800 333 333.



When you wish upon a Star...

Star Micronics UK Ltd has presented their first LC-10 printer manufactured in their new Welsh factory to the Prince's Trust, the charitable organization whose president is HRH The Prince Of Wales.

And no, Phil Collins wasn't at the event (shame though...)

The Star LC-10 is hot property, and the presentation was made at the PC User Show last month. The Managing Director of Star – Mr T Takahashi said, "The production of the first printer at the new facility in Wales is an important milestone in the development of the Star organization as a whole, and I am delighted to present our very first machine, not only to a worthy cause, but to an organisation which also has 'Welsh connections'"

The Establishment of a manufacturing facility, near Tredegarin south Wales was announced last november by Peter Walker – the Secretary of State for Wales.

The presentation launch at the PC User show was full of smiles, hand shaking, speeches and not a mention of the dreaded organisation "European Commission" (see last month's news item).

Lintrack design

Oundle School's well-known computer department is successfully using Linear Graphics' Lintrack PCB designing program in conjunction with an A3M Plotmate plotter.

Robin Newman, head of computing, says that it has revolutionised the way in which PCBs are produced. "The software is very useful as a practical CASD application within various examination syllabuses and, as an Econet version is available, several pupils can use the system simultaneously. Standalone versions of Lintrack cost £99 while the Econet network version costs £210 plus £10 per terminal.

● **Contact: Linear Graphics ☎ 0702 541663**

Mannesman Tally launch 24 Pin Printer

Europe's largest printer maker, Mannesman Tally is pitching a has all the usual automatic paper direct challenge at NEC with the loading facilities we have come to launch today of a high perfor- *and* MT ANSI (!!) and the NEC P mance 24 pin dot matrix printer. expect from a modern – and series – well I did say it was an

Priced at £695 – the company expensive – printer. claims the new printer's 220 CPS It is a 136 column printer, and (draft) and 72 CPS letter quality there is talk of adding on a colour speeds will offer PC users unpre- option later on this month for an cedented price and performance extra £100. Additional bits and benefits. pieces are a twin bin feeder.

Mannesman Tall have named their printer the MT 222 (catchy little name that don't you think?) and it has been designated for printer particularly useful when I

Epson LQ codes, Proprinter XL NEC basher didn't I?

Add to this the final kick in the teeth of supporting eight internal fonts and I think you'll agree that this printer needs checking out – needless to say we will be looking at it in a later A&B.

For a printer that is clearly aimed fairly and squarely at the office, there are a great many Beeb and Archie users who may find this

● **Contact: Mannesman Tally, Molly Millars Lane, Wokingham, Berkshire, RG11 2QT. ☎ (0734) 788711.**

Graphics tablet

Cherry Electrical Products have announced the availability of a graphics tablet with both parallel and serial ports. For £550 the packages includes the digitising tablet, a 4-key, cross hair cursor puck, a stylus, power supply, interface cabling, a set of user-defineable menu strips and marker pen and full documentation.

The tablet has an A3 working area of 384m by 260mm (29mm without menu strip). It is claimed to achieve a resolution of 0.1mm with an accuracy of better than plus or minus 0.5mm.

● **Contact: Cherry Electrical Products Ltd., Coldharbour Lane, Harpenden, Herts, AL5 4UN. ☎ 05827 63100.**

A&B/Watford Electronics Open Day!

A&B and Watford Electronics are getting together for an open day on Sunday the 25th of September. The Editorial staff will be there, along with our major contributors, so come along and have a chat – it's basically a mini show, but with none of the "barrow boy" overtones that prevail at recent Micro User shows – it should be fun as well!

The plan is to have special desks set aside showing demonstrations of Watford, Acorn and other quality hardware applications. Amongst others David Janda is pencilled in for the Comms spot, Gordon Taylor on the Arc and Mark, Darrin and myself will be on hand to discuss the way we feel the new Acorn are going.

There will also be a chance to get hands-on experience of both the Archimedes *and* other machines in the Acorn family – especially the MS-DOS applications we are porting across especially for the show.

Be there or we'll send the A&B Brothers round to ventillate your windows!

Screen Restorer

Now this is a weird product!

Many portable computer owners (pay attention you Z88 owners out there) constantly get frustrated at the way the plastic screens that cover the LCD display of your portable computers get badly scratched by sheer wear and tear, grime and so on. Well it seems that a company calling themselves **Ultrasoft Innovations Ltd** have come up with a screen restorer called **Ultralucent** they claim that the scratched screen will eliminate scratches and scores and restores these screens to brand new condition!

And before you start thinking that this liquid is just an ordinary polish, I checked out a little of this "magic liquid" and pasted some of it on my badly scored corner on my laptop portable (an NEC, but it could so easily be a Z88!). I waited a couple of minutes and... Hey! I can not only read the screen, but I can also read each pixel on the LCD panel.

Not bad.

Before you get too excited about the prospect of removing all that surplus crap from your portable's screen, may I temper it slightly by telling you that this stuff is only available from Ultrasoft, and they happen to be in downtown New York (on main street no less!) It costs $19.95 and add another $3 for shipping and handling charges – it's worth it if you have a scratched screen and it is far better than buff-polishing it believe me!.

● **Contact: Ultrasoft Innovations Inc. 76 Main Street, PO Box 247, Champlain, NY. 12919. ☎ (514) 487 9293.**

The Daisywheel strikes back!

In the days before high quality dot matrix printers and laser printers, the only way of obtaining decent quality text was to use a daisywheel printer – a computerised equivalent of the electronic typewriter.

The problem was that the cheapest daisywheel printer retailed at nearly £600 just a few years ago because of the large number of moving parts, and even though dot matrix printer engineering has made it possible to have a high quality printer with less than five moving parts (if you choose to ignore the pin head!), the number of parts in a Daisywheel printer has, by nature, remained relatively unchanged, hence the slower speed and vast expense.

***Matmos Ltd* and *Computer Appreciation* (surely not the same Matmos that bashed out the old Scribe CP/M machine?) have struck up a deal with Triumph Adler for a daisy wheel printer at the impressive price of £119.50 each – which is quite a lot of product for your money.**

The Triumph Adler Royal Office Master 2000 is a West German product manufactured under the Royal and the Adler tradenames – when these printers first came out, I must admit I wanted one, but at the asking price (you don't want to know how much they were) I forced myself to forget about them and stay with my grotty old JP101 that I still own to this very day!

Perhaps I had better get one quick before you lot buy them all up.

● **Contact: Computer Appreciation at 30-31 Northgate, Canterbury, Kent, CT1 1BL. ☎ (0227) 470 512.**

Archaeology activists

by Des Thomas

Cambridgeshire Software House's *Archaeology* has been around for a couple of years and occasionally snippets of information about very exciting work using the program have reached us, eg Nottinghamshire have produced a very interesting pack about Nottingham Castle which is available to schools within the County.

For those who do not know the program, I suppose the easiest way to describe it is to say that it's an open ended *Mary Rose*, ie you can plan your own archaeological dig, but some teachers and children have used it for very imaginative adventures.

The only datafile known to us which is generally available is the one of Fishbourne from Barry Holmes, one of the authors of Archaeology (Send formatted disc plus 75p to Barry Holmes, St Helen's C.P. School, Bluntisham, Cambs.).

If you have produced a file using *Archaeology* and would be prepared to make it available to others – we are looking particularly for files on places of interest which might be visited by schools from another area while on extended educational visits and those that have used the program in a highly imaginative way – then please send us details. Depending on the response, we'll either publish a list of addresses with a brief synopsis or publish the best as one of our software offers.

Minerva Release Gammaplot for the Archimedes

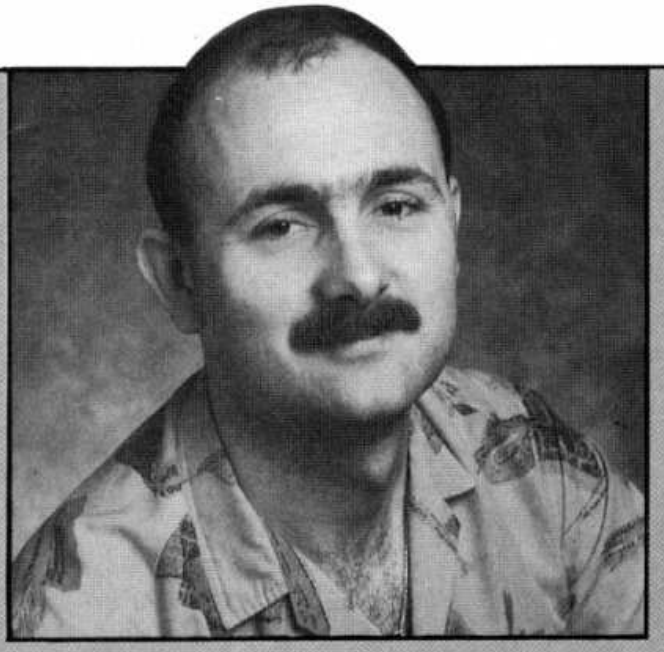
GammaPlot is the latest in presentation and business graphics with a full art package included. It has been written in ARM Assembly Language, and Minerva claim that their package makes full use of the Archimedes' staggering colour and high resolution display.

GammaPlot also supports the six main graphics and chart types of line, scatter, pie, histogram, 3D Histogram, and text only charts. A drawing and customisation facility is also available to easily create distinctive images to be added with your graphs. All the rest of the features you would come to expect are here such as bordering, line density, support for the Arc's ever growing library of fonts, and a complete set of tools to help you draw much easier with the mouse.

Minerva tell me that their GammaPlot package is completely defineable, displaying up to 20 charts at any one time in any position to any size (although you may not get them all on the screen at the same time), more than one graph can be displayed on the same axis and there seems to be adequate support for overlaying graphs (as one does with an overhead projector) and a slide show facility is also included, although there is also full support for Integrex and Star colour printers.

Screens may be merged automatically with word processors like 1st word plus and data may be imported from the System DeltaPlus database or the Sigma-Sheet files – Minerva also tell me that thier package will import data from other packages but didn't elaborate.

● **Contact: Minerva Systems, 69 Sidwell Street, Exeter, EX4 6PH. ☎ (0392) 37756/410137.**



The start of a new column! A&B convertee Bruce Smith writes on the state of the industry

It was about 18 months ago that I was sitting in a backroom at Acorn when their erstwhile MD Brian Long entered to show some DTI officials the Archimedes pending its fast approaching launch. Not quite sure who I was (yes, there are some) (lucky for them! – Ed), Long carried on with his marketing spiel. The upshot of it all was that he informed his captive audience that Acorn was expecting to sell around 120,000 units by the end of 1988. Not such a brash assumption for a BBC Micro hailed as the fastest in the world.

However, the fact of the matter is that to date Acorn have only shipped 14,000 units, 6,000 short of the number that had expected to move by the time St. Nick had filled our 1987 Christmas stockings. Of that, 14,000 probably only 10,000 or so have found their way into homes, schools and the very odd office.

The reason why? Most would say that the pricing is prohibitive. Rubbish! The 310 is very well priced and the A440 represents remarkable value. No, dear reader, the answer is much simpler than that; *Software.* Since Acorn released the Atom and original Beeb, the needs of the computer user the world over has changed drastically. Punters in their droves no longer buy computers to program – they buy them to *use* . They want software. If the software is no good, or doesn't exist they find some that does, and buy the computer it runs on, and that's generally a PC or Macintosh.

Apple are a prime example. An equivalent Macintosh will set you back a cool £2000 but no one buys a Mac to program. It's a wordprocessor, a database, a spreadsheet and a desktop publisher. Who would buy a PC to program? What's more, the price of the Mac isn't stopping Apple attacking the education market with all guns biasing.

For the Archimedes to take its rightful place Acorn must invest heavily in software development, relying on their all to a few third parties simply isn't enough. Of the traditional houses only Minerva are producing real native Archie software. The likes of Computer Concepts would appear to be supporting the machine but in essence they are providing software to run under the 6502 emulator.

Acorn themselves began to put a finger on the problem. They wouldn't bundle View with the Archie as they wanted a native wordprocessor to be marketed. Ten months later they release Arcwriter, written in BCPL and containing more bugs than Catweazel referring to it as *the* wordprocessor for the Archimedes. Subsequently they have talked Grafox into porting that top-seller, Logistix to the Archie and GST's First Word Plus. But this is hardly innovative. First Word Plus has been around on the PC and even the ST for some time now and hardly pushes the Archimedes to its limits.

If there was ever a need for Acornsoft Ltd to be resurrected then it is now. the Archimedes needs a massive injection of native, innovative software if it is to be taken as a serious potential purchase by those other than us committed users. Unfortunately I don't foresee a second coming.

So, no Acorn User Show. That has to be one of the biggest disappointments of the year to all Beeb owners. The AU Show has always been the best event of the year and the one that all dealers and users want to attend. You can lay the blame for this one firmly on the Redwood (Acorn User) door step. As one who has been at the heart of AU until recently I can reveal just why it isn't going to happen.

Acorn have decided that what you and I want is an up-market show. Put simply, we don't want to attend and buy new software, new books or hardware that's difficult, if not nigh on impossible to find on the local high street. No, we want to attend a show almost devoid of BBCs, Masters and Electrons. We want to attend a show where we can look and talk to dealers and where we can attend stimulating lectures.

Acorn have threatened Redwood over this in the past but they have, to their immense credit, stood quite form on the matter. This year Acorn decided to pull the plug, once again showing their undying support for the man in the street. If Acorn feel that their new approach to an AU Show is going to pull in the punters they have to kidding. For that matter will it pull in the dealers?

But the most disappointing fact is that Redwood didn't have the conviction to go it alone. Of course it wouldn't have been the *official* AU Show but that wouldn't have put me or you off of attending.

Now this isn't supposed to be an anti-Acorn column, in fact heaps of praise for their decision to bring down the price of the Master 512 to an incredible £99. The Master 512 is one of the very good things to come out of Acorn over the past few years. It's fast and reasonably compatible, if you want to learn about MS-DOS and run some industry standard packages. The 512 coupled with a Master (or Beeb with a co-pro) is an excellent investment. Hurry though, there's only 3000 left and Acorn won't be producing anymore.

BMF- A hit for the Arc

By the A&B Brothers

A&B were at the Wembley Conference Centre for the British Music Fair at the end of July, as were Acorn who became the first computer company to exhibit at a music exhibition.

Heading up the floorshow was none other than Mike Beecher of EMR who has been commisioned to produce a complete music system for the Arc (see our June issue). In addition to Soundsynth which we briefly reviewed in June, Mike also had a prototype of his *24 plus* sequencer which looks set to thrash the socks off similar products on the 16 bit micros but will cost about half as much. This will of course run in conjunction with Acorn's MIDI podule which is now in production.

Furthermore several software distributors previously working with 16 bit machines are seriously considering the Arc as the next *serious* computer for professional studios.

● Next month we have been promised an exclusive look at EMR's new offerings along with some new BBC B software designed to help school children with their music practice.

All this plus a look at the latest MIDI hardware launches and a novel use of Masters in the field of *pub entertainment*. Not to mention a **Free Flexi-disc** with an audio tutorial of how to put a single together using a beeb and a MIDI interface. **Don't miss it!**

Over to you Clive.

Role Reversal

Thanks Darrin.

Alternatively you could look at the show from another point of view. As I write I was still feeling the shock of this show, yes it could have been classed as professional, no there were no 12 year old brats to get in the way, and no, there were no barrow boy stalls. What there was, was far more annoying.

Row upon row of synthesisers, rack mounted effects, computers (there were plenty of those) and a whole host of computer software packages greeted me as I walked in, an ST over there, an Archimedes over there... a *what* ? Yes the Archie was there is full swing, in fact there were two, one on the aforementioned EMR stand, and the other on the Yamaha stand – proving that the Archie has got into some high places indeed. And it did leave a mark as well on a number of the professional punters thank God – it seems that Mike Beecher has a strong product there and I am gladly proved wrong – for once!

The main problem is the fact that there were very few companies dealing with instruments that didn't require a 13 amp plug at the end of a flex.

No, if you were looking for musical instruments of the strictly manual kind, then I am afraid there was very little other than some very lovely looking guitars, a number of revolutionary new basses on the Washburn stand, and there were a few electric fiddles I just had to try out.

The Synths just annoyed me, the effects bewildered me, and the same damn smarmy sales pitch from the greased back suits got so annoying, I just had to leave early and console myself with a couple of Human Rights Now! tickets at the nearby Wembley Stadium.

Sorry.

Archimedes Mandelbrots knocks 'em dead at Symposium

On July 1st, a symposium took place on *Fractals and Computer Art* at the Delft University of Technology (The Netherlands). The event was organised by the *Delftsch Studenten Corps*, a major student organisation of Delft, as part of the celebration of their 140 years in existance.

Invited to give lectures about fractals were Professor Dr Peitgen from the University of Bremen (Germany), Professor Lauwerier from the University of Amsterdam and Dr Mandelbrot himself from the Thomas J Watson Research Center in the USA.

In a Hands on corner, several computer companies were invited to show their com,puter art and fractals, and amongst the "big" contenders, including such lumineries as Hewlett Packard, Apple, Prime, Tektronix and Commodore, the Archimedes was present putting all othere routines to shame!

The Dutch Acorn Distributors Eeckhorn Computers BV were there to show, in co-operation with their local dealer, ECD, the fastest Mandelbrot fractals of the day. Processed in real time, where others only dared to show downloaded screen pictures from floppy disc (you should have seen the Amiga trying even *that* - snigger!), the sensation of the day was the 2 second mandelbrot written by S.Streater of Kings College London. The program had been downloaded from SID – Acorn's specialist database – just a day before the symposium started!

1500 Computer and fractal enthusiasts attended the symposium and at the end of the day, Dr Mandelbrot himself gave away an Archimedes to the designer of the most beautiful fractal to a Mr G Sipma of Hoevelaken – a set of books were given away for the second prize.

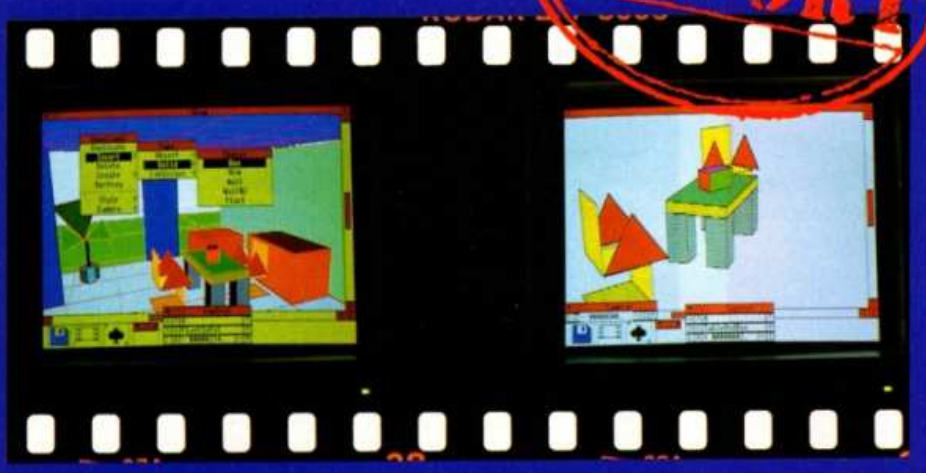
It is nice to see fun with advanced mathematics and it is nice to see the Archie kicking ass, as usual.

Nice one lads.

● **Contact: Acorn at 245 Newmarket Road, Cambridge.**
● **Contact: Eeckhorn Computers B.V. c/o Wouter Kolkman, Poortweg 6, 2612 PA Delft,Holland. ☎ (010) 311 569 365.**

Gordon Taylor

Archimedes REPORT



Euclid teams up with Archimedes to provide superb solid modelling

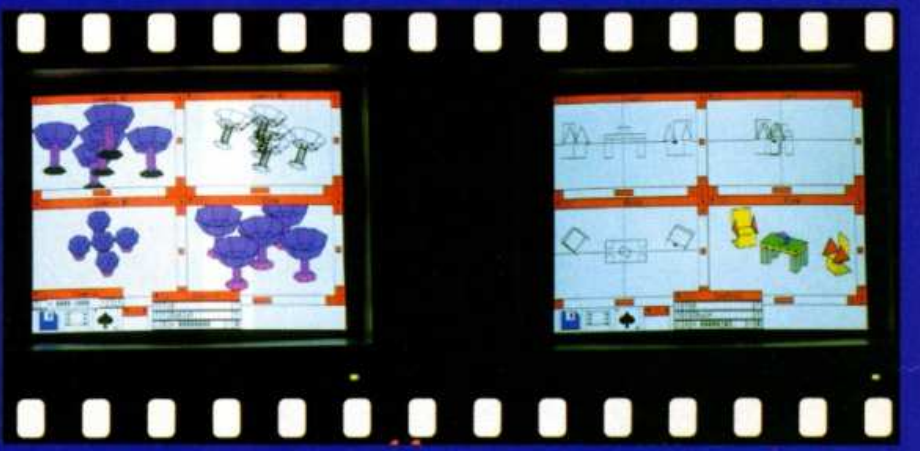
Introduction

Imagine being able to visualise almost any object or scene, even before any physical model or prototype exists. This is the purpose of the Euclid 3-D Graphics System, which runs on the Arc. Moreover, it can be visualised from any position, in any direction, and at any scale, and with a wide range of colours.

Indeed, these may all be varied interactively, using wire-frame or faceted styles, with full hidden surface removal, and in any Arc screen mode. Data entry is particularly easy, with libraries of existing objects, and utilities to import from most 2-D CAD packages. It comes complete with drivers for producing outstanding hard copy – using printers and plotters, in both mono and colour – and programs for animated displays.

Forerunners

The Model B/Master, with its bit-mapped screen, of relatively high resolution, has attracted many attempts at 3-D graphics. Most have been limited to wire-frame, but some provide the faceted style, with hidden line removal. The best of these are even capable of "real time" display – at least for simple objects. The family of products published originally by Glentop, and later by Silicon Vision is perhaps the best-known. These use a machine-coded "graphics engine" in ROM, with everything else in RAM. Since the program uses two screen banks for smoother animation, and yet has to run on a Model B (without shadow RAM), there is not much RAM left to hold the data and an "editor" program – so the latter is somewhat difficult to use.

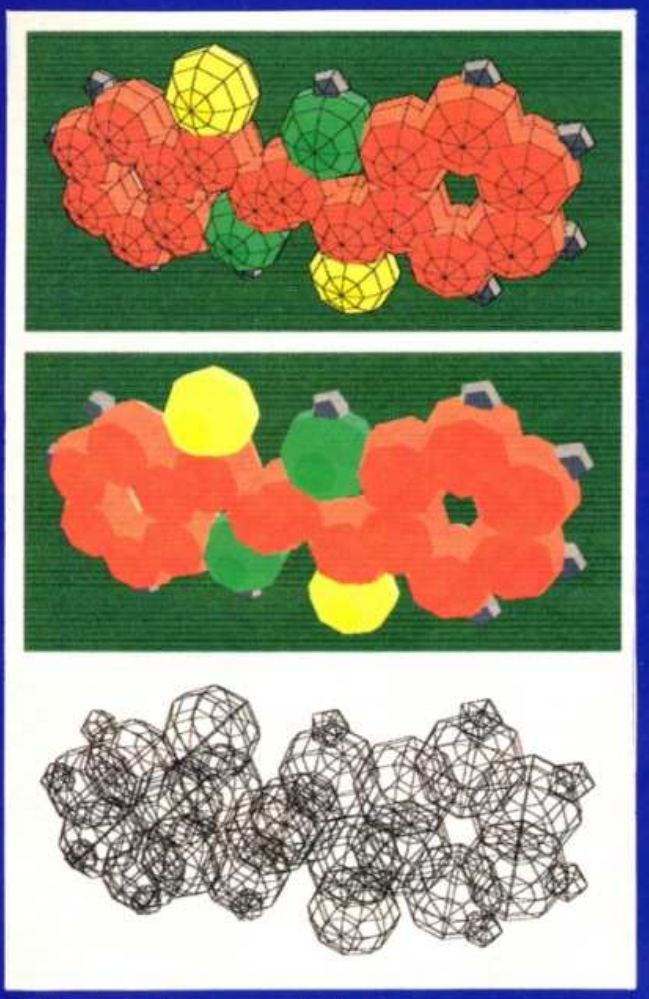


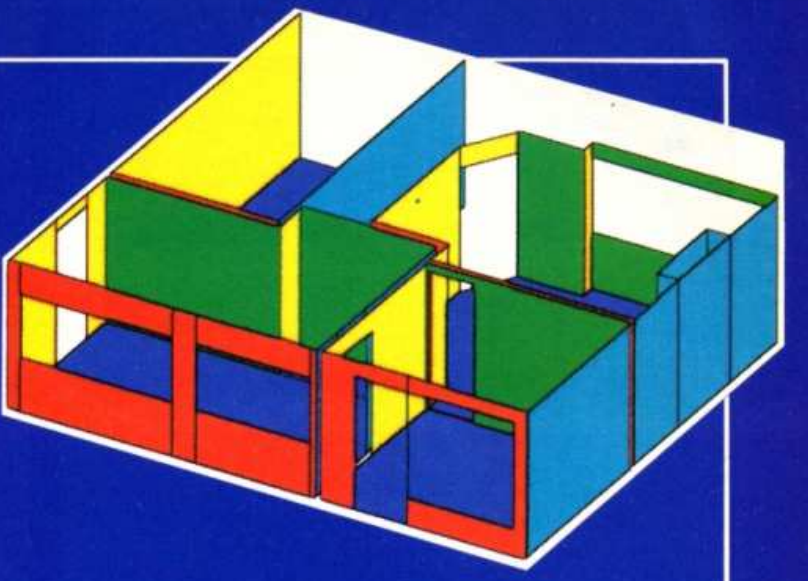
The Euclid System

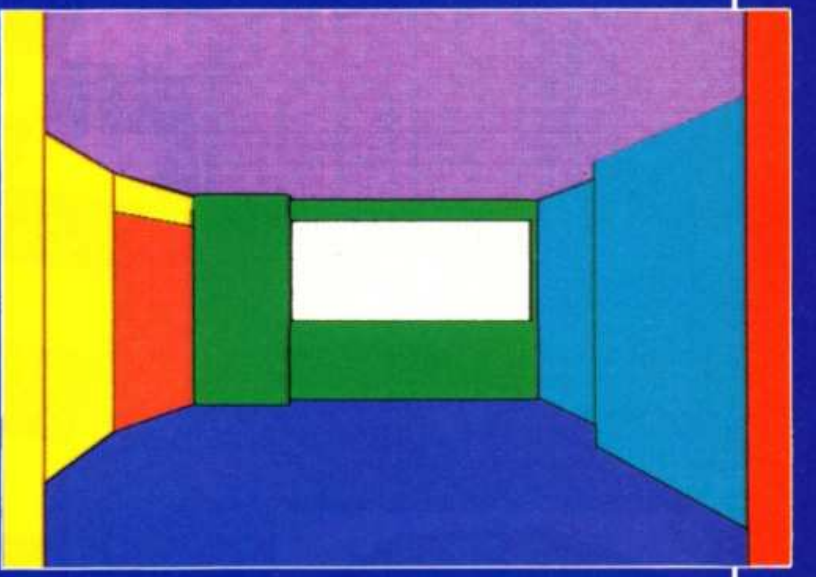
From the above, it is apparent that the Arc has much greater potential for 3-D graphics – which has been realised by the Euclid system, which also uses a machine-coded "graphics engine". This is a relocatable module of some 24K, which is loaded into RAM – along with the drawing data and an inter-active "Design" program of some 56K, which is very easy to use. Screens in Mode 12 (640 x 256 x 16 colours) take 80K, and those in Mode 15 (640 x 256 x 256 colours) and Mode 20 (640 x 512 x 16 colours) take 160K.

Due to the compactness of the code for the Euclid module and the "Design" program, even in a 305, the Screensize may be set to 160K, while leaving about 50K free for data and workspace. Correspondingly, in a 310, the Screensize may be set to 320K, and still leave about 400K free. Since the drawing data format is also very compact, these are ample in practice. If sufficient screen RAM is configured, the Euclid system also uses two screen banks for smoother animation. However, if space is tight, it will default to working with a single screen bank. Again due the compactness of the code and data format, Euclid works perfectly well with a single floppy drive.

The Euclid system is a 3-D solid modeller, which uses so-called boundary representation (b-rep), where the shapes are built up from triangles, rectangles, and higher polygons. It differs from those which use Constructive Solid Geometry







(CSG), where the shapes are built up from cuboids, cylinders, spheres, etc. However, many "solid modellers" are hybrids – often using CSG for mass property calculations, and b-rep for display, as it is faster. In the Euclid system, the objects may intersect, and form concave (as well as convex) surfaces.

The most important thing about a 3-D graphics system is the data structure. If chosen correctly, it enables the amount of data that needs to be entered (and held in the picture file) to be minimised, while being easy to edit and animate. It turns out that to satisfy these requirements requires a hierarchical structure of some kind. This is most obvious in the case of animation, where, for instance, the movement of a hand is best defined relative to the arm, and that of the arm relative to that of the body (ie in a hierarchy).

However, it also makes sense to enter objects just once, and yet allow any number of copies (which may be at any other position and angular attitude, and even scale) to appear in the scene. The Euclid system uses a Directed Acyclic Graph, which is somewhat similar to the hierarchical ADFS. Objects correspond to Directories, and Solids and Landscapes to simple Files. Very importantly, a "root" Object (or "Scene") may have several levels of Object below it. This allows "new" objects (and even complete scenes) to be inserted at any point in an existing scene.

The lowest levels of this hierarchical structure hold data such as the colours of faces, and the numerical co-ordinates of points. Euclid so far supports two types of "primitive" objects. "Solids" are 2 or 3-D objects made up of Planes, which are polygons with up to 256 sides. Planes, (which can actually have appreciable curvature), are themselves defined by Points. "Landscapes" are nets or meshes of rectangles which may be divided into triangles to accommodate curvature, or different colours. They are defined by two or more Vanes, which are themselves defined by Corners. "Landscapes" make it easier to enter data for certain types of object, and are converted to "Solids" within Euclid.

Since the Euclid system is intended primarily for visualisation, it uses fixed- (rather than floating-) point (ie integer) arithmetic. Not only is this much faster, but it then has no need of a hardware floating point unit, which is not yet available, and cannot be fitted to 300 Series machines. This is feasible with the Arc, because the fixed point number range of a 32-bit machine is quite sufficient to describe objects of useful size with entirely adequate precision. In fact, the Euclid system has two size "constraints". The first is for discrete objects, for which the absolute limit is +/- 32,767 – the range of a signed 16-bit number.

However, in order to stay well within this when the X, Y, and Z dimensions are vector-added, the individual dimensions should not exceed about 10,000. The second is for the whole scene or "universe", for which the limit is about +/- 2000 million – the range of a signed 32-bit number. For example, even in units of 1 mm, an object can be as large as a house (10 m), and can be part of a "scene" larger than the UK (2000 km).

Display

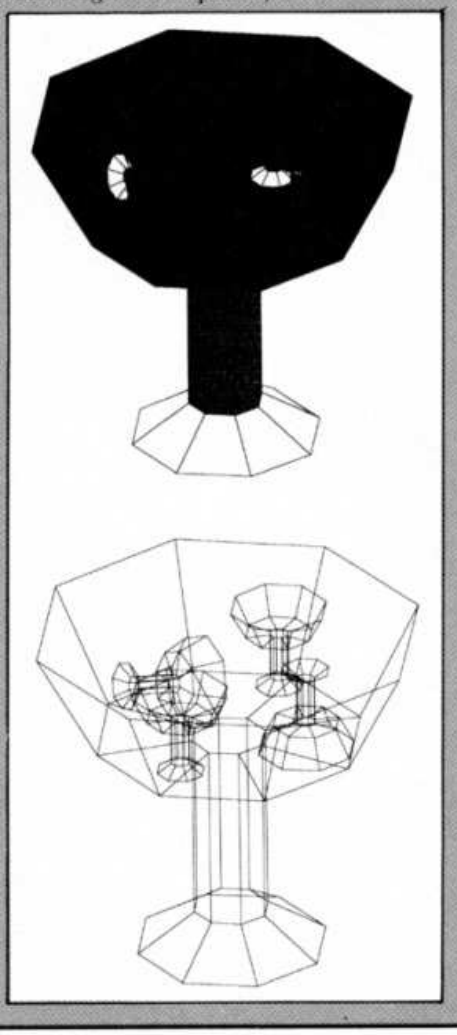
The Euclid system is similar to a conventional CAD system in that the drawing data is "object-based". This means that the images can be "zoomed" without loss of image quality, and can exploit the resolution of any display monitor to the full. Thus it can use any Arc (graphics) screen mode, from 0 to 20. (Indeed, although it has yet to be tried out, it should work with a high-res mono monitor in Mode 22). Colours are specified in RGB, from a range of 4096, and the Euclid system then finds the closest match – using a grey-scale "palette" for two-colour modes, a dither-patterned palette to extend 16-colour modes, and a "look-up" palette for 256-colour modes.

On-screen images require to be redrawn after zooming, panning, editing etc., and the time taken depends upon the resolution of the screen, the complexity and apparent size of the object or scene, and on the style in which it is "rendered"

The major styles for 3-D graphics are: edges only (wire frame), painted faces with hidden surface removal, simple illumination with incident light only, and ray-traced for both incident and reflected light.

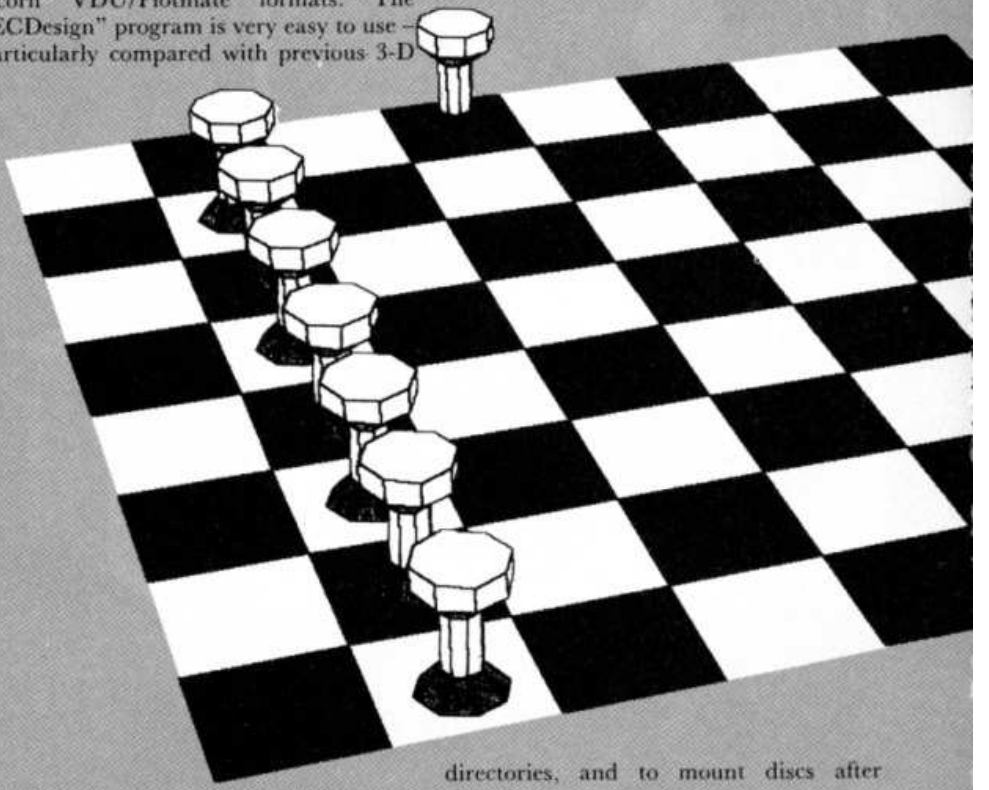
Even with the speed of the Arc, only the first two or three styles are possible in "real time" – and even then only for scenes of a certain level of complexity. However, even the second style gives an excellent impression. Thus Euclid is able to visualise 3-D objects and scenes, and they may be moved inter-actively (usually with the mouse) in the "Design" program. They may also be displayed and animated in other programs. While in theory, redrawing should take only one frame interval (one fiftieth of a second) for movement to appear completely smooth, in practice, up to one fifth of a second is acceptable – especially when "bank switching" two screens. This allows smooth animation of quite complex objects and scenes (such as the Globe in Mode 12).

While the present release of Euclid is capable of only the wire-frame and painted face styles, the data structure is designed to accept incident light, and ray-traced rendering. This is very sensible, since the greatest investment is in data entry. Thus once a 3-D object or scene has been entered, a future release of Euclid could display it – both still and moving – in any of these four styles (although ray-traced rendering would require pre-recording of the sequence).



The Design Program

Most users will use the "ECDesign" program for the entry and editing of the data for 3-D (and also 2-D) objects and scenes. While working to scale, it is not a conventional CAD package, and has far fewer "primitives", and no facilities for dimensioning or text. However, the Euclid system includes utilities for importing data in DXF format from 2-D CAD packages, which provide these, and for exporting drawings in DXF, HPGL and Acorn VDU/Plotmate formats. The "ECDesign" program is very easy to use – particularly compared with previous 3-D graphics packages on the Model B/Master.



It uses the Arc WIMP interface, with up to 16 re-sizable windows to display various views etc., icons along the bottom of the screen, and the mouse-driven pointer. The icons afford access to four menus – File, Print, Goodies, and Windows. A fifth Function menu may be popped up by clicking with the middle button in any of the edit or view/camera windows.

The Window menu allows the selection of the various display and control windows. The default (and generally most useful) setup is with three orthogonal views (eg Above, Front, and Left), together with one angled "View". The first three (or their complements, Below, Back, and Right) are used for data entry, while the view in the fourth can be adjusted to any position and angle, and any zoom/size. Windows may be re-sized, pushed to the back, or deleted, in the usual way. In particular, any one may be re-sized to occupy most of the screen, (leaving the icons and Control etc windows at the bottom). The Windows menu is marked with those that are currently selected, and allows them to be brought to the front if hidden.

Most importantly, the File menu allows you to Load or to Append picture files containing existing objects or scenes. As for a word processor document or BASIC program, Loading overwrites anything already present, while Appending allows the new to be merged with the old. However, whereas with a word processor, the new is inserted immediately into the old at the cursor position, in ECDesign, Appending puts the new objects into a "pool" in memory, from which they may be selected, and inserted at any position in the scene. The File menu also allows you to save the current scene – using the original name or any other – and to change drive and directory, to create new directories, and to mount discs after changing.

The Goodies menu allows you to change screen mode from within the ECDesign program. Thus, for example, you could edit in Mode 12 for quicker redrawing, and then view in Mode 15 for more colours, or (with a multi-frequency monitor, and enough screen RAM), in Mode 20 for higher resolution. By default (and as documented in the manual), the "Y" axis in Euclid is vertical, and the "Z" axis perpendicular to the plane of the screen. However, another option in the Goodies menu makes the "Z" axis vertical (inter-changing it with "Y") – notably to fit in with architectural practice (eg floor plans). To distinguish the various surfaces (Planes), during data entry, I found it helpful to colour-code them (eg North walls – red) – even if the colours would be changed later. This may be done by re-setting the default colour in the Goodies menu, or by setting the colours individually. Alternatively, the background may be set eg to &DDD – a light grey – against which Planes in the default colour of &FFF – white – are obvious.

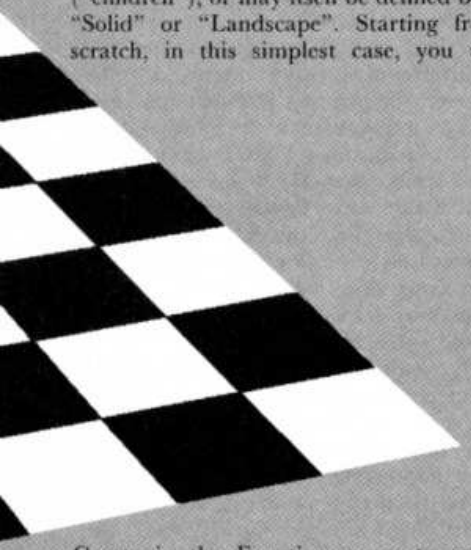
Data Entry and Editing

The style used in each of the display windows may be set by clicking on them with the Menu button to bring up the

Function menu, and selecting "Style". The current choice is : wire-frame, faces only, faces and edges, and mono faces and edges. The usual (and default) setup is wire-frame in the three editing windows, and faces and edges in the View window.

Create

The "Design" program starts up with a "root" object, named "$" by default, showing at the top of the Control window. As with all other objects (above Planes and Vanes), it may be re-named by clicking on it. This "root" Object (here the "parent") may contain other Objects ("children"), or may itself be defined by a "Solid" or "Landscape". Starting from scratch, in this simplest case, you use



Create in the Function menu to select Solid (or Landscape), and name it, whereupon the name appears in the middle of the Control window.

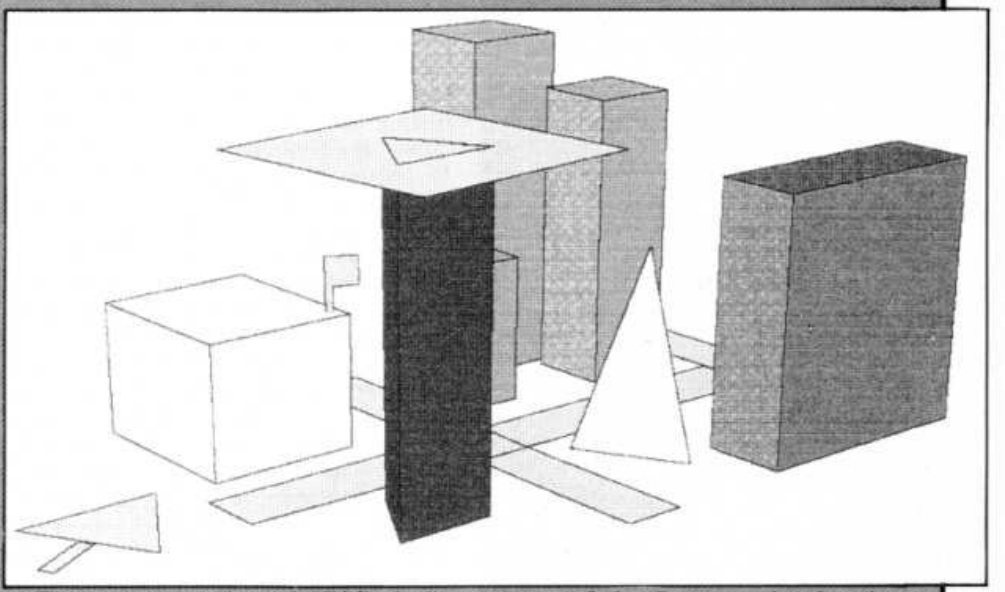
The Euclid system allows objects to have the same name, and will automatically assign a numeric suffix to distinguish them. This allows you to Create (or Append) a number of variants of a given object, which may be inserted (and deleted) from the (drawing) structure in turn. To continue creating, you click on the down arrow, which moves the Solid name to the top of the Control window. Selecting Create again then leads to a choice of Planes – Regular (polygonal) or Rectangular. (A Landscape would lead to a choice of Linear (approximately flat), or Rectangular).

Selecting either causes Plane 1 to appear in the middle of the Control Window, and the pointer to become a ring with cross-hairs. A solid "blob" will also appear in the three orthogonal editing windows, representing the centre of mass of Plane#1. Data may be entered entirely visually, by clicking with Select on the "blob" in any window, and dragging it to a new position. Alternatively, you can supply the co-ordinates by clicking round LX, LY, and LZ in the Control window. You can enter numeric values, either by clicking on the digits – Select to increase, and Adjust for decrease – or as numbers from the keyboard. During these operations, a further window showing the X,Y,Z coordinates of the "blob" may be displayed together, by selecting "Position" in the Window menu.

By clicking on the down arrow again, the "1" moves to the top of the Control window, after the Solid name, and "Point 1" appears in the middle. A blob appears at the origin of each edit window, representing all the Points (four in this case). The pointer reverts to normal, and can now be used to drag the blob, as the first Point, into position in the three windows. Alternatively, numeric data may be entered as before. Clicking on the right arrow in the Control Window will bring up Point 2, and a hollow blob will appear on the line between the two points. Point 3, and Point 4 should be entered similarly, which will specify this rectangular Plane. You may then click on the up arrow, whereupon the solid blob will move to the new centre of mass, and the pointer change again to the ring with cross-hairs.

More Planes could then be added to this Solid. Since Planes (or Vanes) may be adjacent, new Points (or Corners) may be attached to existing Points (or Corners). The "Tolerance" or "Attach" distance is 10 OS units – about 1 per cent of the screen height – by default, but is adjustable (including to 0, for "Off") via the Goodies menu.

Individual objects can be created at the origin, and then moved bodily into position, as above. Objects can also be swung to the correct angle by holding down Adjust, and moving the mouse sideways. The centre of rotation is the "blob" (ie the centre of mass), and the current axis is the one perpendicular to the current drawing window. When you are rotating one Plane (or Vane) relative to another, the hollow blob defines the fold line edge. Objects can also be zoomed to the required size, by holding down Adjust, and moving the mouse forward and back.



The present version of "ECDesign" does not support "Move" (as opposed to "Draw") within a single face definition, nor "transparent" as a colour. Hence to create a panel with a hole in it, it is necessary to have at least one "sawcut" from the hole to the outside. However, a wall with a doorway may be defined by deforming an octagon into a rectangle with a rectangular chunk taken out of it.

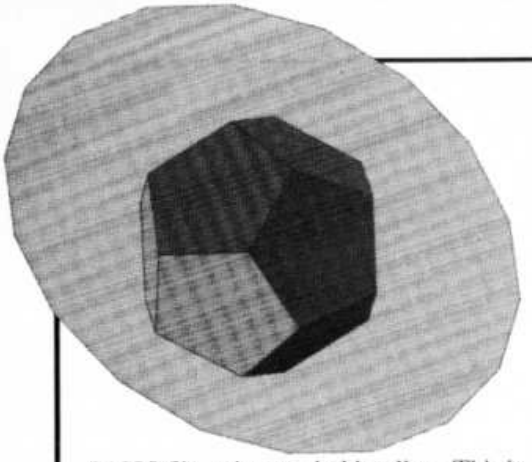
Insert/Delete/Destroy

Another method of data entry is to Append existing objects into the drawing from disc. These may be from amongst those supplied, or – later on – from your own "library" of Euclid picture files. Rather than just a library of objects of different shapes, the Euclid system includes a series of "-Gen" programs, each of which can generate shapes of a given type. Starting with a 2-D plan or profile (entered as a table of co-ordinates), "ExtrudeGen" will "extrude" it along a perpendicular axis, while RotateGen will form a body of rotation. "PlatoGen" will create the family of "Platonic" regular solids, from a (4-faced) tetrahedron to a (20-faced) icosahedron. "CuboidGen" and "SolidGen" are provided for more general, less regular solids.

For the special case of a cuboid, which occurs very frequently in architecture and engineering, "CuboidGen" is easier to use, since it needs only 6 co-ordinates, rather than 72 when using the more general "SolidGen". Likewise, "SphereGen" and "TorusGen" may be used to create polygonal (faceted) approximations to balls and rings of circular section. Because they are written in BBC BASIC, it is easy to modify the default data if required.

Each program generates shapes as Euclid picture files, which may then be Loaded or Appended into "ECDesign", for incorporation into more complex Scenes. When first Appended, they are invisible in a "pool", but selecting Insert leads to a sub-menu for Objects, Solids, and Landscapes, and hence to lists of those available. They may then be Inserted into the structure of the Scene, again changing their position, angle, and scale as required, either by dragging or digitally. Correspondingly, objects may be either Deleted from the Scene (but not from the pool), or Destroyed (which removes them also from the pool).

Data may also be entered or edited in a



BASIC file, using a suitable editor. This is a batch process, rather than inter-active, but may sometimes be easier. Starting with an existing Euclid Picture file, you can run the "BASICFile" program to generate a text file, which may be loaded into Twin, or – after entering BASIC – into the ARMBASIC Editor. The file consists of a BASIC program, with the first statements being a driver program, which accesses a library of BASIC functions, followed by a long list, in which every key-word begins with "FN". After editing, you can either draw the scene immediately, or run the program to create a Euclid Picture file again.

Cameras

Cameras are a special class of object, which provide "viewpoints", and Camera 0 supplies the View window by default. Up to nine may be defined by the user, and are selected via the Function menu, with the number of the current camera being set in the Control window. A camera can stand by itself, or it may be attached to an object. If attached, the view it "sees" will change appropriately as the object is moved. An object may be defined as a platform for the camera (ie in effect an observer), and made current via the arrows of the Control window (so that it is marked by a blob). The camera may then be moved inter-actively by clicking and dragging the "blob" in a suitable edit window – eg Above – and the resulting view displayed in a Camera window (including the View window). Alternatively, the position, angle, and zoom of any camera may be set via the Cameras window.

This window can also display the value of "P". When it is negative, the camera view is orthogonal (which corresponds to the view from infinity), while when it is positive, the view has perspective. While the exterior of an object may be viewed with P negative, a view of the interior from within requires that P be positive. When negative, the value of P has no effect, but when positive, it controls the effective focal length of the camera. For example, P=11 corresponds to a 50 mm (normal) lens, P=10 to a 25 mm (close-up) lens, and P=12 to a 100 mm (tele-photo) lens – for a 35 mm camera.

Figures

The accompanying figures illustrate several interesting points. Thus the chess board was created using a "Solid", while the pawns were created using a "Landscape". For both the squares of the board, and the pawns, it was only necessary to define one, and then replicate it at other positions. Moreover, the single pawn was created by inter-active extrusion, using an open stack of octagons as Vanes. By such means the data to be entered was minimised. However, this has the further virtue that, to change the shape of all the pawns, it would only be necessary to change the one.

In the case of the "hollow globe", I wanted the underside of (some of) the continents to be darker (to provide "depth cuing"). After a little thought, I realised that this could be achieved by inserting a second globe within the first, and then accessing the continents in turn, and adjusting the colours. This is easy for simple darkening, since it is only necessary to reduce each (non-zero) hexadecimal digit by a suitable amount – this being judged by watching the screen. Somewhat surprisingly, a "Plane" can lay within the outline of a continent – even when it is wrapped around a sphere. However, in this case, the surface itself is not truly spherical.

The Molecule is the biggest object known to have been created so far using Euclid. It contains some 1300 facets, but is defined in only 6920 bytes. While the data was quite easy to enter, due to the many replicates, it is understandably slow to redraw. However, this can be speeded somewhat by using Mode 0. (In future, the use of bounding spheres, and of a sphere primitive will speed it further – see below).

Printing/Output

Valuable as it is to be able to visualise an object or scene on screen (and animated), it is often important to be able to produce hard copy, eg on paper or OHP film. Since the Euclid system is object-based, given a suitable printer-driver, it can produce an image with almost any graphics (dot-based) mono or colour printer – and to the limit of its resolution. This can be significantly better than the screen, where to display at a resolution of eg 1280 x 1024 by 16 colours would need 640K of screen RAM (more than any Arc can provide), and a very expensive monitor.

The "ECDesign" program affords access to the Operating System drivers for the Epson FX/MX/RX mono printers at screen mode resolution. In addition, it so far includes drivers for the Epson JX colour printer (and compatibles such as the Star LC-10) at screen mode resolution, the Integrex "ColourJet 132" at both screen mode resolution, and maximum resolution, and the Hewlett-Packard "PaintJet" at maximum resolution only. Moreover, an "example" printer driver is also supplied. This is written (like the others) in BBC BASIC, and extensively commented, so it may be modified to suit other printers.

The images produced by the screen mode resolution "dumps" may be of 512-line, as well as 256-line modes (regardless of the monitor type), and in the cases of the JX and Integrex, are in colour. Compared with those from the JX, those from the Integrex are much sharper, and have stronger colours. However, even better results are produced by the "maximum resolution" drivers. They are designed to print only the contents of the "View" window, (which can be set to show that of any of the 10 Cameras). However, this still allows considerable flexibility, since the Scene may be positioned, angled, and "zoomed" as required, and the window adjusted for shape and size. Smaller images, and close-fitting windows, take less time to print.

The maximum resolution printer drivers take full advantage of the Euclid system. Whereas eg AutoSketch writes a temporary file to convert its plotter-type vectors to the raster data required by a graphics printer, Euclid produces raster output directly. However, for printing at maximum resolution (ie independent of the screen mode), instead of requiring a 1 MB buffer for a full virtual screen, these Euclid drivers write to one 1280 dots wide, but only one line high. This requires that the drawing data be processed for each line separately, but is much faster than using a temporary file, and makes printing at maximum resolution feasible with a 310 or even a 305.

The maximum resolution drivers for the Integrex and PaintJet are very similar. Both use up to 1280 dots horizontally, and up to 1024 vertically (thus matching the screen addressing). However, since each printer normally produces only seven colours plus white, the Euclid drivers use "2 x 2 dithering" to increase this to 125 – to allow better matching of the full 4096-colour Euclid palette. While this reduces the spatial resolution, for a maximum size image, to 640 x 512 for areas of colour, edges and fine lines are still drawn at 1280 x 1024. Both these drivers also contain machine code for speed.

The Integrex prints only one line at a time, at up to 168 dpi (dots per inch) horizontally and vertically. However, it can produce a small and simple print in 3 or 4 minutes, and a simple half-page print in about 13m. A more complex image will take longer, due to increased processing time required of Euclid. The PaintJet prints colours 10 lines at a time, at up to 180 dpi horizontally and vertically. Hence a small print may take 4 m, and a half-page one only 7 m. A very complex image, such as the molecule, takes some 22 m for a half-page print, again due to the Euclid processing time. The Integrex "ColourJet 132" is listed at £569 + VAT, and the Hewlett-Packard "PaintJet" at £1089 + VAT.

Sprite files

A screen may be saved as a "sprite" – with the size of the file depending on the screen mode (eg 80K for 12 or 160K for 20). However, if you select "Just View" in the Printer menu, the sprite is "clipped" to the size of the View Window, which may then be re-sized to control the size of the file. Clearly you need to consider the destination of any such sprite file, since eg Artisan expects sprites in Mode 12 only (and of the

full 80K), and First Word Plus expects them in Mode 12 only.

Import/Export Utilities

The "ReadDXF" program allows 2-D DXF files produced by AutoSketch, AutoCAD, and most other CAD programs, to be imported into the Euclid system for 3-D visualisation. For example, floor plans could be imported, and "extruded" to storey height. The resulting picture file can then be Loaded into the Design program (see figure), and a second storey can be Appended, and Inserted in position above the first. Further objects may be added, and any unwanted objects deleted, and others moved or re-scaled, and any of the facets coloured, before it is finally saved. The result may then be set at any angle or distance for viewing, from the outside, and even from within, and output to a mono or colour printer.

Other utilities allow Euclid picture files to be output to CAD systems and plotted. While they are output only in the wire-frame style, since plotters are not well-suited to producing the large areas of solid colour required for the "painted faces" style, they may be in colour (taking those of the faces that they surround). Thus, the "HPGL" and "Plotmate" programs output a Picture file directly to the respective plotters. Alternatively "WriteDXF" may be used to load a Picture file, and write a DXF file. This may then be imported into the Arc version of AutoSketch (via "Import IBM"), or most CAD packages, to add dimensions, annotation, and output to any supported plotter. Although the plots are at present full wire frames, with no hidden line or surface removal, they can be in colour for easier interpretation. Files in DXF and HPGL formats may also be imported as "Line-Art" into DTP packages such as Aldus Pagemaker and Ventura Publisher, (after conversion from ADFS to DOS format).

Display and Animation

Euclid comes with a "ShowFile" program for the on-screen display of picture files. As it has only 15 lines, it is very easy to modify to your own requirements. Similarly, the "SlideShow" program may be used to show a number of picture files in turn, as a rolling demo. The "Fly" program allows you to fly around your scenes or objects inter-actively, using the mouse, while for self-acting animation, the demo program "LoadDraw" rotates two separate objects – yet is only 20 lines long.

The Euclid system also allows and encourages users to write their own programs in BBC BASIC (or indeed any other language which can access SWI calls). The manual documents all the Euclid SWI calls, and gives details of their syntax. Programs may be based on those supplied, and used for data input, editing, manipulation such as animation, and output to printers and plotters – or indeed anything else you can think of ! Ace Computing are also promoting Euclid for 3-D displays in third-party applications on the Arc. With its immense powers and ease of control, I expect to see many of these in future.

Documentation

The manual is slim, with just 39 A5 pages, but they have a typeset appearance, and it is complete with an index. The first half is devoted to the Design program, divided into Tutorial and Reference sections. The second half documents the inner workings of the Euclid system, including the Picture Structure, and all the SWIs of the Euclid module. In addition, there are extensive comments in all the BASIC programs.

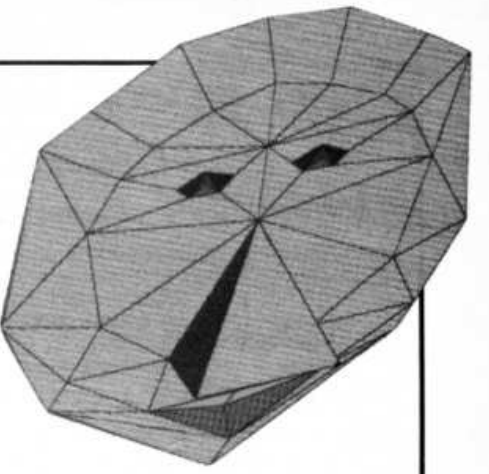
Comparisons

Euclid is the first native-mode 3-D Graphics system for the Arc, but may be compared with packages on other machines. The most notable are AutoShade on PCs, and Space Edit on Macs. These are priced at £500 and £695 + VAT respectively, and AutoShade works only with AutoCAD Release 9 or 10 – which costs some £2500. Moreover, they both require expensive hardware to provide an equivalent visualisation. (AutoShade needs a 386 machine, with at least a VGA card, while Space Edit needs a Mac II for colour). While Sculpt 3-D on the Amiga, and Cyber Studio on the ST have some similar (and some better) facilities, and are priced at only £69.95 + VAT, and £89.95 inc VAT, these machines have much less processing power, and inferior screen displays, compared with the Arc. Conversely, Euclid is priced at only £45 inc VAT, and is better equipped with import/export utilities, and maximum resolution printer drivers. This means that data can be imported as DXF files from almost any CAD package, edited and visualised on screen, and hard copy produced quickly – even at the maximum resolution of the printer. If you require more "primitives" and facilities for 2-D drawing, you could use AutoSketch Arc (£79 inc VAT), or Turbo-CAD (£99 + VAT), which runs well under the Arc PC Emulator (£99 + VAT).

Future Developments

The present version of Euclid lacks "Z-clipping" – which causes surfaces to vanish when they intersect the plane of the camera. This occurs mostly with interiors, and one solution is to make floors and ceilings from Landscapes (see Shades of AutoShade). Another is to view rooms through open doorways (see figure). However, I have seen a pre-release version of Euclid which incorporates "Z-clipping", and it should be available by the time you read this.

Future releases of the Euclid "graphics engine", and the Design and other programs are planned to be data-compatible, with upgrading at only nominal cost. Near-term enhancements should include : – "Constant normal" shading style, for incident lighting, including surface reflectance (as already mentioned in the manual). – Implementing "Bounding Spheres", which will reduce Euclid processing in ECDesign (especially for complex objects), and even more so when ray-tracing. – Including camera data in the picture file (rather than separately, as at present). – Adding ray-traced rendering styles, including shadows and reflections. – Adding curved-surface "primitives", such as spheres and "patches".



Since ray-traced visualisations take time to process (even on the Arc), animations of them will require a "movie-maker". This will use a Euclid Picture file, and a series of camera positions/angles/zooms (as "key" frames), and produce frames for replay in real-time by "in-betweening". It should run wholly in the Arc, but additional hardware should enable output to a video recorder. Although I have seen a first prototype, such a program will require substantial development, and is likely to be separately priced.

Conclusions

The Euclid 3-D Graphics System is the first truly 32-bit application for the Arc. While others such as First Word Plus, PipeDream, and AutoSketch, have benefitted substantially from the 32-bit speed, they were originally written for the PC. Euclid however has been written to take maximum advantage of the Arc, and thus provides 3-D visualisation that others can only match with far more expensive hardware. While the images on a standard monitor are very good, with up to 256 colours, those produced by a standard Archimedes using a multi-frequency monitor are of full professional quality, with a resolution better than a PC with VGA, or a Mac II.

Moreover, the Arc has ample power to animate (and later ray-trace) them. The Euclid software includes utilities to import from most CAD packages, and drivers for plotters and printers – including ones producing the maximum resolution and colours – and is thus remarkable value. It already matches or exceeds many functions of other visualisation packages – most of which are far more expensive. In addition, it originates in the UK, where users can enjoy full support, and contribute to its future development.

Factfile

The Euclid 3-D Graphics System is priced at £45, inc VAT, and is available on mail-order, cheque-only, from Ace Computing, 27 Victoria Road, Cambridge, CB4 3BW. ☎ 0223-322559

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The Chroma 300 provides a *keying* signal to operate a high speed electronic switch which selects the video output from the Archimedes for the duration of an overlay.

Ann Owen

CHROMA Colour

Archimedes has no problem entering the world of video production with the help of a new add-on from Wild Vision

Computer and video generated images do not combine easily. The composite video output of your BBC Micro can be recorded on video tape but a record is all you will get. You can point a camera at a colour screen and superimpose the output over your main shot but quality suffers.

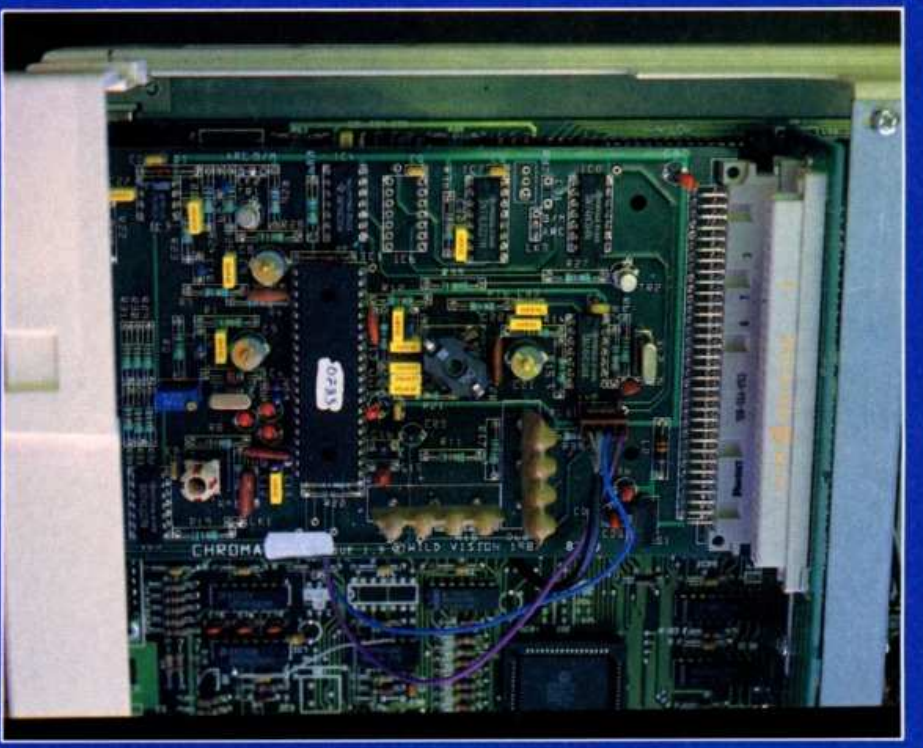
Computer graphics on top of moving footage is a more attractive idea but it requires add-on hardware. It introduces the idea of computer generated captions and titles for still pictures and of using computer graphics to present facts and figures while the video images roll on behind.

The BBC Micro has always, via third party products, been able to lock its video signal into another picture signal from a source such as a camcorder (portable video camera/recorder), domestic VCR or video disc player.

Currently the most renowned video/graphics combination is the Advanced Interactive Video of the Domesday Project. In that system the Master 128 has a genlock facility which *synchronises* the two signals, one from the computer and one from the video disc player. For video disc player substitute any video source.

Genlock podule

Wild Vision have long provided genlock cards for the BBC Micro and now there's a card for the Archimedes, one of the most promising micros around when it comes to video production. Wild Vision's Chroma 300 Model C is provided in the form of a podule card which fits into the backplane of an Archimedes 300 or 400 series computer.



Circuitry within the Chroma 300 senses if any of the Red, Green or Blue outputs has an intensity level of 14 or 15. If they have then the colour is overlaid. Only one of the three primary colours need be of high intensity, thus offering a range of colour mixes.

Chroma 300 is a genlock and video overlay system. It sychronises the computer output to an external PAL video signal and converts RGB to PAL, overlaying the computer signal onto the external video signal.

The more advanced graphics capabilities of the Archimedes are ideal for scientific and

industrial uses where overlays need to offer detail as well as be attractive. Information generated by the computer, such as a time and instrument reading can be overlaid onto a recording of an experiment or process.

In theory the computer graphics on screen could completely overlay the video signal beneath. The Chroma 300 software handles this by having the *high* intensity colours overlay the background while *low* intensity colours become transparent. Because the colours can be edited, the programmer can cause any combination to be either high or low intensity, either displayed or transparent.

Editing of colours is done with good old VDU19 with the new l,p,r,g,b parameters, where l and p are the selected logical and physical colours. To cause the physical colour associated with a given logical colour to appear as an overlay a value of 128 is added to both l and p.

Installation

The Chroma 300 fits into one of the sockets of an Archimedes backplane and is secured to the rear panel of the computer in place of a single blanking plate. Two connecting leads have to be fitted to links on the board. If the supremacy bit is to be used to control overlays then a further wire must be soldered to link PL3B and a link on the Chroma 300 cut.

The Chroma 300's RGB input is connected to the RGB output of the computer by a small jumper lead while external video is connected to a PAL colour monitor and, if desired, a video recorder.

Where to go

G2 Systems

G2 Systems' complete business is video computer graphics. Set up by video engineers, the company has "learned" computers over the past few years and now specialises in broadcast quality video graphics.

Many thousands of customers know G2 from their software packages for the 8 bit BBC Micros. Many studios around the country use their BBC, genlock and software combinations to generate VTR leader clocks, captions and autoqueue text. G2 believe that other computer systems currently being marketed into the video trade are unsuitable. Archimedes fits the bill as far as they are concerned.

In a studio a black and burst sync reference (from the studio's sync pulse generator) is applied to the video input of the Chroma 300 which causes it to operate in remote mode. All graphics output from the Archimedes is then PAL coded to a high standard and the colour subcarrier synchronised to the studio reference so that the signal can be mixed in a video mixer.

Triangle Television

Triangle specialise in supplying computers for professional use in the audio/visual field. Still a production company in their own right, they can offer a wealth of experience in video making for marketing departments, sales forces and promotions. Support services include training in video production.

Chroma 300 data

Input signal: 1Vpp CCIR/PAL composite video or separate sync **Input impedance:** 75 ohms **Output signal:** 1Vpp PAL composite video **Output impedance:** 75 ohms **Input from computer:** RGB and composite sync **Colour bitfan:** Colour encoding is disabled if external signal has no colour burst **Power supply:** Model B/Master 128 +5V, Archimedes +12V both at 140 mA max **Size:** Single PCB 160 x 100mm mounted in single podule for Archimedes

A Chroma 300 'C' with added chroma signal processing is available for professional applications.

Glossary

Interactive video - a video disc or tape player combined via genlock with computer graphics and controlled through the computer keyboard and especially **PAL** - the European (except France) standard of television having 625 line **Genlock** - hardware which synchronises two video signals

Factfile

G2 Systems, 5 Mead Lane, Farnham, Surrey GU9 7YD. ☎ 0252 712525.
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By British Rail: VICTORIA STATION. The halls are a 10 minute walk from the station.

By Bus: 11, 24, 29, 70, 76 and Red Arrow 507 to Victoria Street – alight Army and Navy Stores.

Archimedes COMPUTING

Expectations have been raised by the Archimedes screen resolution and art packages like Clares' Artisan. Watford's Video Digitiser sets out to meet those expectations with pictures captured from video camera or recorder.

Pictures from a video source are digitised (turned into an image in digital form) by a special unit. They can then be saved in a format suitable for other software. The Watford Video Digitiser is a podule card which achieves the above. It plugs into the backplane of the Archimedes. On board the digitiser podule is 128K RAM which stores the currently grabbed picture and an EPROM which contains the control software.

You'll need a BNC to BNC cable to link your video source into the digitiser but from then on it's a matter of focussing the camera.

Action!

We used a standard black and white camera with manual focussing. Such cameras should cost no more than £200 and can often be picked up at bargain, sub £100, prices by mail order.

The difficulties you will face in order to achieve a good image on screen include getting a consistently good light source and supporting and adjusting the camera. If you have a camera tripod it can, in all likelihood, be used with the video camera. The better the tripod the easier it becomes.

You can also digitise from other sources, such as a video recorder with a video out connection. Low quality tape recordings usually don't synchronise so digitising from broadcast pictures is best. A monochrome signal is preferable if this can be achieved with your equipment.

Image capture

Capturing images of people and everyday objects is easy enough. They are large and, for black and white digitising, you don't even have to get them to stay still! It is possible but more difficult to digitise artwork and large print and only practical with a tripod.

The digitiser passes the video image through to the monitor as though "live" via *SEE. An individual capture is achieved with *GRAB.

In 256 colour screen Modes you can display 16 grey shades on your standard colour monitor or reconfigure to display 64 shades on a monochrome monitor. In 16 colour screen Modes a 16 grey shade palette is standard (*Bwpal) but other palettes can be applied to the image. In two colour screen Modes, dot patterns – selectable from six predefined sets – are used to represent the grey shades.

The 512 by 256 pixel image from the digitiser is scaled to the selected screen Mode. With a multisynch monitor Modes 18 and 20 are supported and a true 640 by 512 line frame can be grabbed in Mode 20 as long as the image is stationary.

Colour grabbing by using red, green and blue filters is achieved with a ColourGrab program supplied on disc. It prompts for the three separate "grabs" required, carries out the processing into a single colour picture and then offers colour/tint editing.

Filing

Screen images are inevitably large and a *FastSave and *FastLoad speeds up the storage process. *GrabSave automates the grab, save sequence via single key presses.

*PicSave saves the digitiser memory with an optional Z (*Zit) operation first. *PicLoad boasts a dozen parameter options determining how a disc-based picture should be reloaded/combined with the current digitiser contents. A user-defined operation can be carried out automatically by setting the U parameter.

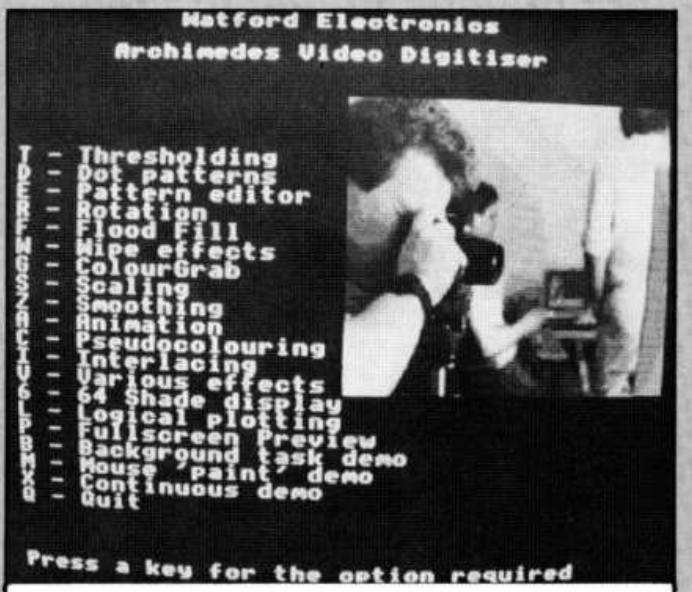
Printing

The digitiser software is nothing if not comprehensive. A second natural output device for a screen image is a printer and a *PicDump command (SWI Vdig–ScreenDump &802D0) is provided to print pictures from any graphics Mode for FX and LQ compatible printers. PicDump is a remarkably comprehensive command, reminiscent of ROM-based dump programs for the 8 bit BBC. It is a useful addition to the Archimedes in its own right.

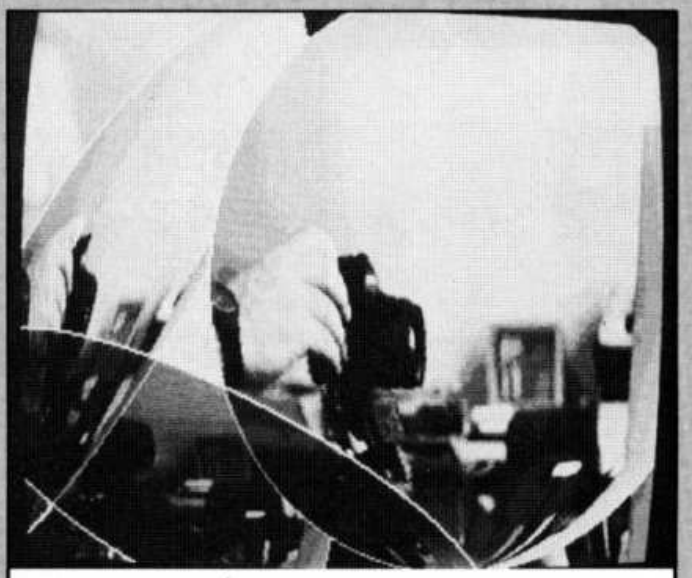
Any part of the screen can be dumped to any specified size with a variety of printed dot densities and patterns to give best results for a particular picture/printer combination. The program ensures that the printout has the correct aspect ratio although the picture can be stretched or squashed.

Special effects

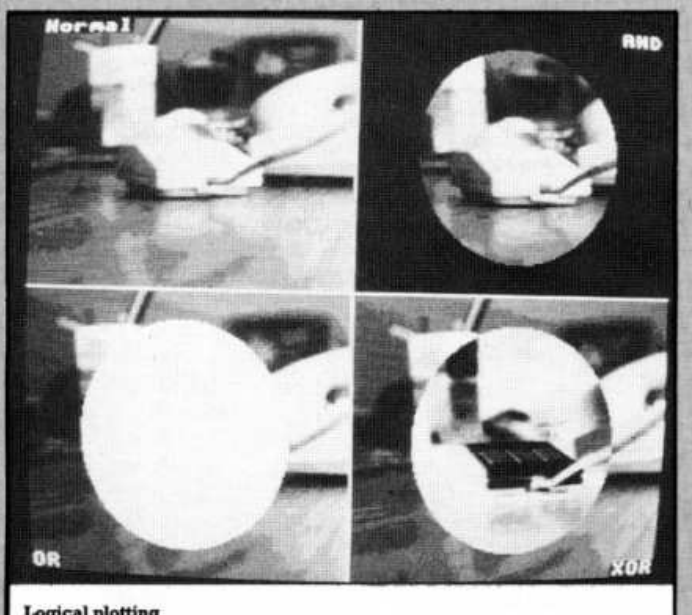
There are a number of image manipulation routines available to the programmer at SWI level. SWI Vdig–Scale &802C6 offers scaling up or down of any screen extract with hori-



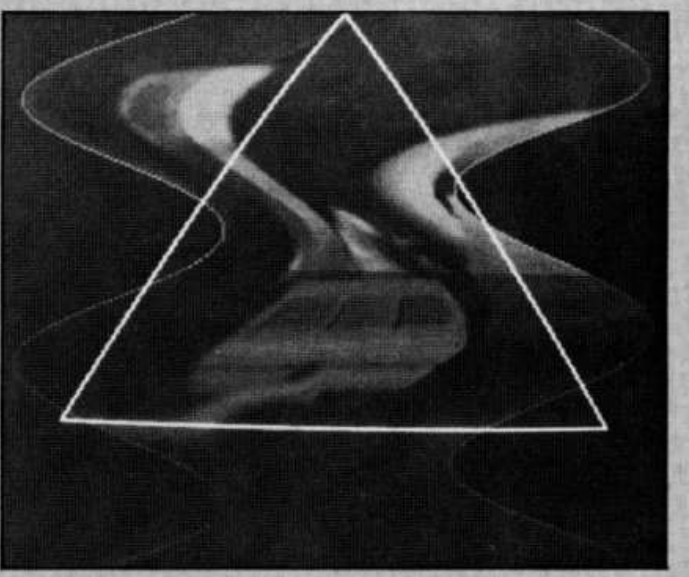
Effects menu – combinations of BASIC and ARM assembler underlie all the effects demonstrating that this is a highly versatile system



Flood fill of regular shapes



Logical plotting



zontal and vertical flip and will fill a screen, a "indow or an area bounded by the last two graphics cursor positions or last two mouse positions. SWI Vdig-Rotate &802CA rotates an image about its centre or other other specified point, scales up or down and plots the centre of rotation at the graphics cursor.

The digitiser is supplied with an impressive array of programs on disc which make full use of the SWI routines in conjunction with BASIC V. You won't see the like on any other current microcomputer without very expensive add-on graphics processing.

Image processing

A couple of image processing routines are included in the relocateable module software, *SMOOTH and *ZIT. The former averages each pixel with its nearest neighbours to remove noise from a picture at the cost of detail. Parameters allow multiple passes and display at any stage of the process. *ZIT – can't you guess? – removes "spurious spots (usually due to noise) in the image". It helps especially with the compression used by *PicSave.

Other image processing can be achieved by passing pixel values from the digitiser through user-defined lookup tables, which are normally used for matching the digitised image with the screen Mode. SWI call

Vdig—Tables &802C7 reads or changes the contents of a lookup table. *TableSave and *TableLoad file the data as an Acorn allocated filetype.

Applications

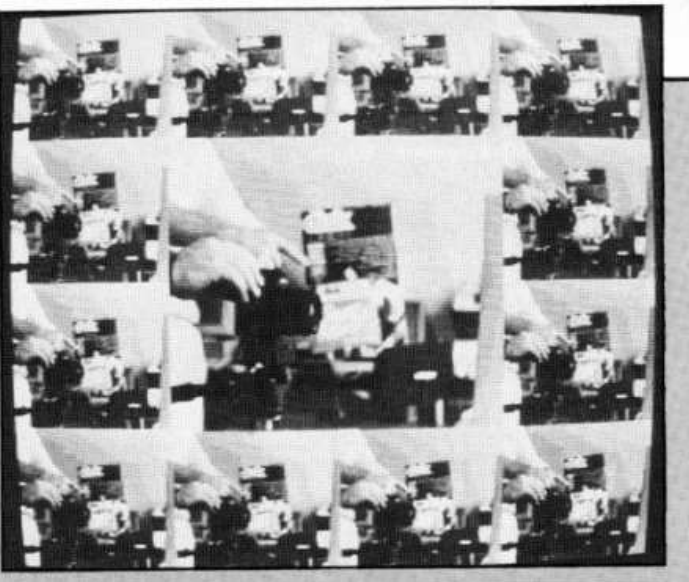
Digitised pictures can provide interesting backgrounds for various programs, presentations, courseware, adventure games and so on. Because captured images can be easily programmed as sprites from BASIC, they can be manipulated and animated too.

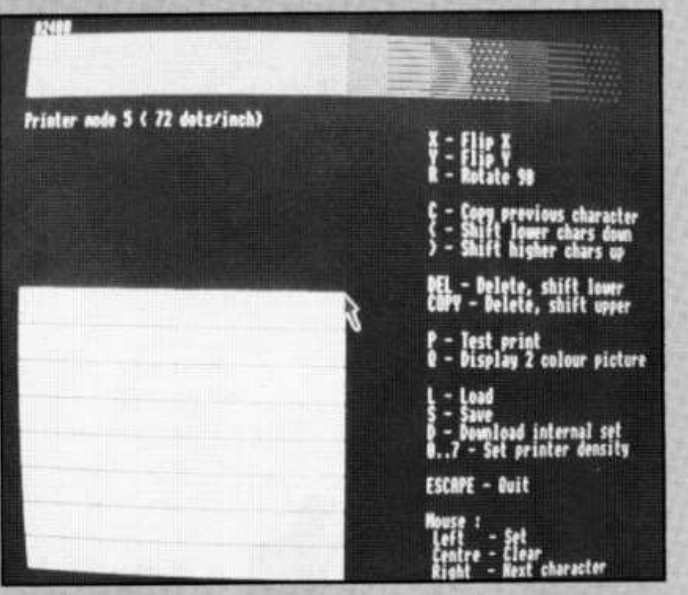
Cataloguing a collection of objects or a group of people is also possible via a database which can hold a screen as a field within a record. Such a database is Superbase Professional from Precision Software and rumours have linked this program with Archimedes.

Because the digitising process is programmable, it can be automated to make a visual record of an experiment. This could then be replayed in a screen window with additional graphics and text added by way of explanation.

DTP

For desktop publishing, digitising is an alternative to scanning flat artwork but it is probably worth waiting for a professional scanner to emerge for the Archimedes for this very specific purpose.

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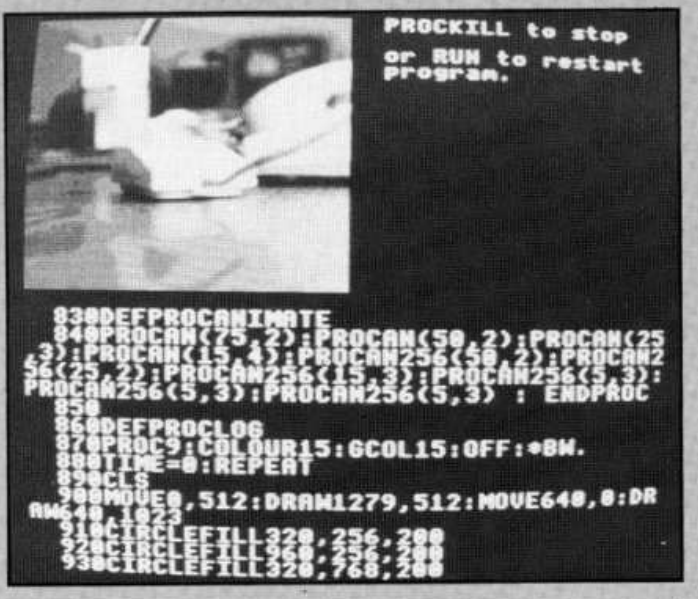

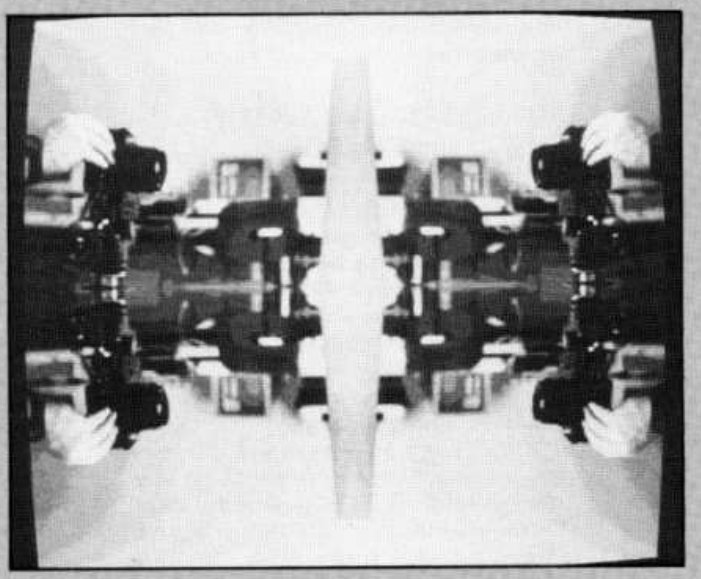

probably worth waiting for a professional scanner to emerge for the Archimedes for this very specific purpose.

Success

One of the great successes of the design is the integration into the Arthur environment via * commands. "Where's the flashy front-end?" some might say. Well you can have as many front-ends as you like by configuring a *grabkey* for use within an application to send a "grab" command to the digitiser. This applies currently to paint software like Artisan, Arctist and ARM Paint and using these is covered in the manual. Future graphics software would do well to incorporate a "capture key" from the outset.

The manual is a professionally produced pearl of reference with contents and index, introductory and technical explanations. The whole tradition of BBC owners creating their own specific applications is set to take a giant leap with this addition to the system.

The Watford digitiser is good value when compared to rival systems on 16 bit computers. It is superior in quality and competitively priced – especially if you already have the camera equipment. The speed of the Archimedes hardware and BASIC V allows some very powerful television type effects to be performed. It's no toy and I recommend it to you if you have a specific use in mind. If you don't, find one!

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DISC INTERFACE

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Clares Artisan	34.74	39.95
Clares Artisan Utilities	17.35	19.95
Timeworks	Coming Soon	

ARCHIMEDES UTILITIES		
Clares Toolkit Module	34.74	39.95
U Connect	52.13	59.95

AUTOSKETCH
79.00 Ex VAT **90.85** Inc VAT

AUTOSKETCH is a precision drawing package with a friendly appearance that makes it particularly well-suited to the beginner or occasional user. At the same time it has great "depth" and provides many features of a two-dimensional CAD package. The files are upward compatible with AUTOCAD Autodesk's full 3D CAD package for PC computers and workstations. Microman Computers are an AUTHORISED AUTOCAD DEALER for full details of all AUTODESK PRODUCTS for Education and Business please contact Kevin Shave.

ROLAND PLOTTERS	Ex VAT	Inc VAT
DXY880A A3	591.30	680.00
DXY1100 A3 - NEW	713.04	820.00
DXY1200 A3 - NEW	956.52	1100.00
DXY1300 A3 - NEW	1129.57	1299.00
DPX2200 A2	2999.00	3448.85
DPX3300 A1	3999.00	4598.85
GRX 300 A1 - NEW	3999.00	4598.85
GRX 400 A0 - NEW	5800.00	6670.00

BBC MASTER 128		
Master 128	379.00	435.85
Master Turbo Module	120.00	138.00
Master 512 Upgrade	99.95	114.94
Microman 512 Disc Utils	11.26	12.95

BBC B/B + UPGRADES		
Acorn 1770 Disc Interface	49.00	56.35
Acorn ADFS ROM	26.08	29.99

DISC DRIVE SPECIAL
5.25 40/80T 400K (640K ADFS)
DISC DRIVE
65.00 Ex VAT **74.75** Inc VAT

BBC MONITORS		
Philips CM8833	250.00	287.50
Philips Green 7502	73.91	85.00

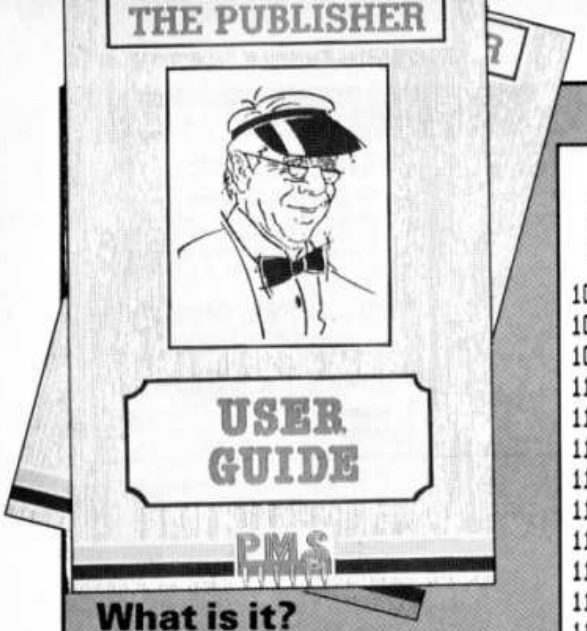
WATFORD PRODUCTS		
Solderless ROM Board	32.00	36.80
ROM/RAM Card + 32K	39.00	44.85
ROM/RAM Card + 64K	52.00	59.80
ROM/RAM CARD + 128K	80.00	92.00
32K Shadow RAM Board	59.00	67.85

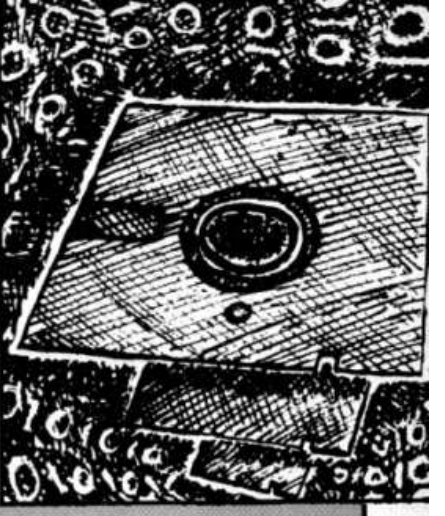
CONCEPT KEYBOARDS		
Concept Keyboard A4	115.00	132.25
Concept Keyboard A3	146.50	168.48

PRINTERS		
Star LC-10	173.04	199.00
Star LC-10 Colour	216.52	249.00
Star LC24-10 24 Pin	329.00	378.35
Epson LX800	209.00	240.35
Epson LQ850	549.00	631.35
Epson LQ1050	549.00	803.85
Star Laserprinter 8	1995.00	2294.25

For our full
ARCHIMEDES, MASTER, BBC
and PC price list please phone.

GOVERNMENT, NHS AND EDUCATIONAL ORDERS ACCEPTED





What is it?

The *Publisher* is the latest in a long line of programs designed to improve output from wordprocessors. The Publisher has all the normal features of this type of program but it also has several new features and impressive features.

So what does it do?

You can use any of the following features anywhere in your text.

1. Fourteen sets of fonts and two sets of icons.
2. Any amount of user defined fonts.
3. Seven styles of boxes.
4. Seven styles of underlining.
5. Variable height and width of any of the fonts.

To avoid having long strings of commands up to ten macros can be defined. A macro is any number of commands joined together to form one new command. A good example of a macro is one that would switch to double height and width, turn on underlining and centre a title.

What do you get?

The Publisher is supplied on a 64K PAL-PROM and is compatible with all the BBCs from the Model B to the Compact. It works with the main four wordprocessers – VIEW, Wordwise, Wordwise Plus and InterWord. An Epson compatible printer is also required.

A utility disc is supplied containing the font designer and also some example texts for the various wordprocessors.

The 67 page manual is a perfect example of how a manual should laid out; there is an introduction, instructions, lookup tables of the commands and helpful hints.

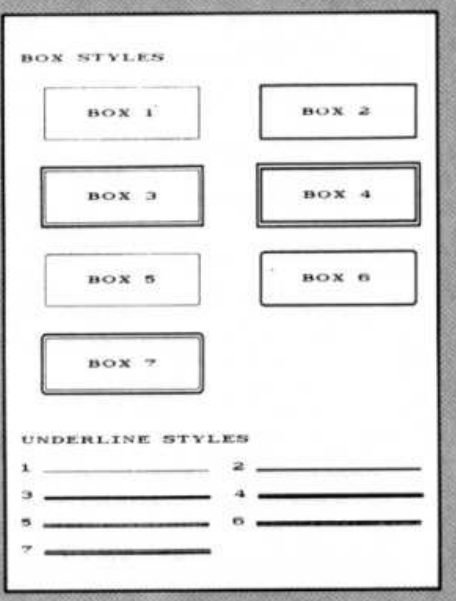
The PAL-PROM behaves just like a normal ROM and it is fitted using the same method. You can prefix the star commands with a "P" if there are clashes with other ROMS. BBC Model B and B+ owners will find PAGE has risen by &100 bytes so some games may crash. The Publisher provides a command to disable itself so this is not a major problem. On the Master the memory is claimed from the private RAM so PAGE stays at &E00.

PUBLICITY MACHINE

Before printing your document you can preview it "on screen". This facility stands The Publisher head and shoulders above its competitors. With most of the old programs you had to make a printout of the text to check that the layout and the fonts were correct. This was time and paper wasting. The Publisher displays the output and in high resolution graphics showing the effects exactly as they would appear on paper.

A useful by-product of this preview method is that you can use the display from within BASIC programs to create impressive looking titles and text.

Other things The Publisher can do is to super-script, mid-script and sub-script text. The text can be printed in 10, 12 or 15 characters per inch or with proportional spacing. You can choose between four different types of background. You can emphasise text and print it either centered or left or right or block justified.



My comments and criticisms

The on-screen preview occurs in MODE 0 or 3 depending on the length of the document. If the document is too long it is impossible to preview but printing is still possible. Users with shadow RAM or a second processor can always preview.

Apart from the few minor quibbles above I cannot fault The Publisher and would I recommend it to anyone who wants to liven up their wordprocessor output.

FactFile

The Publisher costs £44.85 and is available from: Permanent Memory Systems, 38 Mt. Cameron Drive, East Kilbride, G74 2ES.
☎ 03552 32796

Tony Self

If you are into computer graphics then you will find the *ScreenMaster* video effects routines very interesting. The machine code routines have been developed in sideways RAM format and can be blown into an EPROM if you have an EPROM blower available. The code is only compatible with Master Series computers.

The individual effects are present in the machine as * commands and are therefore easily programmable from BASIC or assembler.

Effects terminology

Fade – fade to background colour

Checkerboard – builds a display out of "shattered glass" pieces

Trickle – forms up as bits are randomly placed from the top of the screen

Pull – the roller blind effect with the new sreen scrolling over the top of the old

Reveal – the old screen slides away to reveal the new one beneath

Roll – the new screen pushes the old one aside as it scrolls into view

Slide – the whole screen slides

Wipe – the new screen wipes away the old as it scrolls into view

SCREEN MASTER

Fades, wipes, reveals, pulls and checkerboards. What are we talking about? Professional video effects for your Master 128 or Master Compact, that's what

You can obtain Screen Master from Reader Services. The cards are as follows . . .

DB97 BBC Master version price £10.00.
DB98 BBC Master Compact version price £12.00.

Reader Services details on Software Sale page.

```
*H. SCREEN

Screen Master 1.00 - A.J. Self 1987

*SHLOAD <filespec> <load address>

*SHSWAP <X> <Y> or *FX110,X,Y
Where X is the swap number and
Y is an optional parameter (see below)

Swap  Effect
  0   Instant
  1   Overlay down
  2   Overlay up
  3   Overlay right
  4   Overlay left
  5   Scroll down
  6   Scroll up
  7   Scroll right
  8   Scroll left.
  9   Slide down - Mode 0 only
 10   Slide up - Mode 0 only
 11   Slide right - Mode 0 only
 12   Slide left - Mode 0 only
 13   Horizontal close
 14   Horizontal open
 15   Vertical close
 16   Vertical open
 17   Reducing square
 18   Expanding cross
 19   Venitian blind down
 20   Venitian blind both
 21   Venitian blind up
 22   User characters - Y sets no. of chars
```

Parameters and effects available with ScreenMaster

G2 Systems: 5 Mead Lane, Farnham, Surrey GU9 7DY
Telephone: (0252) 712525

CHROMA 300 SERIES -genlock system for BBC Micro's

The Chroma 300 Series is a genlock and video overlay system for the BBC Micro range, including the Archimedes. It enables the output of the computer to be superimposed, in colour, on a PAL video signal from a video recorder or camera for less than £300 (ex VAT).

G2 Systems is the U.K. specialist in interfacing computers to video equipment. We offer a wide range of hardware such as genlocks and RGB to PAL coders plus video software for captioning, painting, prompting etc.

If you want professional advice about anything to do with video and the BBC micro give us a ring on
0252 712525

Computer Solutions for Video

G2 SYSTEMS

David Janda

COMMUNICATE!

July 1st was a sorry day for the world of Comms. David Janda assess the aftermath of Black Friday

The Scene is Set

Once again this months column is taken up with talk about the Prestel/Micronet tariff changes that came into affect on July 1. I've been watching developments, (or the lack of them depending on your point of view) since the price rises were first announced and things have been interesting!

As predicted in last months column the new pricing structure caused an uproar amongst users. Thousands of mailboxes, chatlines messages and letters of complaint were sent. Subscribers used just about every means possible to voice their anger at the proposed changes that were to take effect on July 1, which many called *Black Friday*.

The Letter

So what happened? The first fiasco came about when informing subscribers of the impending price increases. Both Prestel and Micronet were obliged under law to give one months notice (in writing) of any changes in the pricing structure.

This ment that subscribers should have received their letter no later than Wednesday June 1. According to Prestel's Tony Sweet, said letters were handed to the Post Office on Friday 27 and Tuesday 31 May. However, Many subscribers didn't receive the letter until the following week...

Further, many letters sent to residential users were headed "Dear Business Micronetter". It transpires that the 'business Micronetter' was anyone who had joined InterLink, Micronets gateway to Telecom Gold!

The letter, written by John Tomany MD of Telemap Group Ltd also contained a fair degree of flag waving (waffle) – pointing out how the service had improved. This also upset many people who would beg to differ (see The Situation Now).

The Reaction

No sooner had the news story about the impending price increase been released, the chatlines were flooded with angry users complaining left, right and centre. Of course one would expect some people to moan about anything, but what was most interesting was that the majority of the comment was concerned with the 1p off-peak time charge and not the Prestel/Micronet subscription increase. Indeed, I cannot recall reading a single complaint about the new subscription rates.

The fact is that the 1p time charge has doubled the cost of using Prestel/Micronet when the cost of the phone call is taken into account.

Petitions were soon started up on *Gallery* which is an area on Micronet that subscribers can use to publish their own mini-magazines. It was also very sad to read through *Gallery* and note the editorials from many contributors who said that they would not be able to afford the new charges, and would have to close down their area.

Protest also originated from Micronet Sub-IPs (individuals who contribute material on a volentary basis). A very large degree of Micronets output is done by these contributors who edit areas including *Spectacular, Waveguide, Amsters' Cage, 16/32, The Midnight Micronetters Club (TMMC), PC Support* and others.

These magazines contain letters areas, and many subscribers were writing in asking questions about the tariff changes. Needless to say the powers that be at Micronet did not inform the contributors of the impending charges. As a result the editors of these areas were left in the dark and unable to answer the many questions put to them.

The Farce

Questions were being asked about possible concessions. People wanted to know whether it would be possible to move the "window" of free access (Midnight-8:00AM) to an earlier time. Also, the mailbox facilities which are used extensively by Micronet subscribers would be subject to time charges no matter what time they were used. Subscribers wanted to know if it would be possible to move mailbox within Micronet thus avoiding the charges.

A large degree of correspondence in the letters sections proposed the scrapping of the off-peak time charge in favor of a higher flat rate subscription. Many supported this idea.

On Wednesday June 15 a Celebrity Chatline was hosted by John Tomany (MD Telemap Group), Felicity Thorpe (Product Manager), Tony Sweet (Prestel) and Francis Jago (Editor). Hundreds of questions from anxious subscribers were sent in previously, and many more on the day itself (despite one of the Prestel computers breaking down).

The answers given from this group can best be discribed as insulting. Instead of intelligent, clear and informative answers that one would expect, readers were presented with a load of repititcous marketing pap that read as if it had been generated by an *Eliza* program that gained its "intelligence" from the borstal boys school of economics.

Despite the thousands of chatlines and letters of complaint, one idiot amongst the management group in answering a question which raised the point about peoples complaints answered thus:

"Whilst there have been some complaints online, it has only come from a minority of users."

Bullsh★t!

The facts are that of the complaints aired in the letters sections and on the chatlines were, to a large degree sent by passive users who rarely, if ever, send in any correspondence at all. These, and the regular users must have numbered in the thousands, and without a doubt represented the majority of the user base.

Another little gem eminated from the collective intelligence from The Gang of Four when replying to a subscriber who pointed out that they didn't think they would get value for money with the new charges. Besides a standard answer the following was printed:

"There are few hobbies that cost less than 60p per hour to use and enjoy."

Too right, at 60p per hour off-peak time charge plus telephone cost including VAT totalling over £1 Micronet is not one of them!

The Celebrity Chatline was soon called Celebrity Farceline, and users were furious in the manner in which the management had treated them. It was later claimed by Micronet that a cross-section of questions had been answered, but according to the chatlines and letters sent on following days this was not the case. Nothing in the "interview" was mentioned of concessions, nothing said about moving mailbox within the Micronet CUG, indeed nothing of any value or comfort was

said at all.

In the space of three hours Micronet managed to lose a lot of respect and credibility amongst both subscribers and contributors. The damage caused by the interview will be very hard to repair.

The Window

One question (amongst many) that was not answered during the Celebrity Chatline, nor at time of going to press, concerns the free window.

Between the period of Midnight and 8:00AM the 1p off-peak time charge is waived for Micronet subscribers as long as they stay within the Micronet CUG. Practically all comments made about the window have asked/suggested that it be moved to a more sensible earlier time.

The one snippet of information that came from the Celebrity Chatline was the following statement:

"The free window is a special concession to Micronet, recognising heavy late evening/early morning usage among our subscribers."

Telemap admit that a deal was struck between itself and Prestel as they have the right to do. However it does beg the following question:

- Does Micronet pay for the concession by paying Prestel revenue that it would have gained had there been no window?

I cannot see how Prestel could offer the concession free of charge. The more likely situation is that Micronet is paying Prestel a fixed fee, or the equavilent revenue that Prestel would have generated had there been no free window. This being the case then there would be no reason for Micronet not to move the window to a more sensible time.

No reason that is except it would cost Micronet more. Why? Because despite what Micronet say about a large proportion of usage happening in the late evening/early morning (a figure of 40% has been quoted), a damned sight more people would use the system if the free window were placed between 8PM and 4AM.

Black Friday, Blue Monday

On the days preceeding *Black Friday* a couple of irresponsible users decided to hold a swear-a-thon on the chatlines that are run by Micronet. It would give anyone who decided that they didn't wish to continue subscribing a chance to vent their anger by swearing on the Chatlines. This, it was hoped would get them kicked off the system in style.

Sure enough June 30 came and some people started to swear and abuse the chatline facilities despite a warning from the Net that they would be closed down. The swearing was not amusing at all, but what was amusing was watching throughout the evening as some mysterious gang of editors (soon dubbed *The Secret Police*) went about the system blotting messages left, right and centre! A few of the chatlines were temporarely closed down "for the duration".

On a more serious note the effects of the new pricing structure were obvious the following Monday. Besides the absence of many who had threatened to leave, and who did, the system was not lively during the evening at all – obviously nobody wanted to pay the 1p time charge. Come midnight and quite a few people logged on for the novelty value, but it was noticable then that things were not the same.

As predicted in last months column, the interactive side of Micronet has fallen dramatically. Chatline 1 which operates on a carousel basis used to be "rotated" two or three times a day. Now, the frames on the carousel are used up once every two days or so. Other chatlines have suffered too, and the number of letters sent to the various areas have dropped dramatically.

Mailboxing amongst subscribers has also dropped because, even checking to see if there is any new mail will result in a time charge.

A glimpse of the Micronet we used to know and love? The former main page for the user's TMMC page – a shadow of the past. You'll be missed!

Just what is chargable, and what isn't is proved confusing. Even though Micronet had a whole month (if not longer) to determine just what is and is not within the free window users are, at the time of writing still confused as to what they can look at without clocking up charges.

The Situation Now

Without a doubt the Net is not as lively as it used to be. It's a sad situation, and the blame for it must fall squarely on the shoulders of Prestel and Micronet.

As far as Micronet is concerned it's a far cry from what it used to be. Before one got the feeling that the people who ran the service were enthusiasts themselves. Indeed, in the days when David Babski was the editor this was the case. Now Telemap is run by marketing people who refer to Micronet as the "product". No doubt they know how to be professional at managing, but whether they know the "product" as well as the people who use it on a daily basis do is another thing.

The whole business of the tariff changes has been dealt with by Prestel/Micronet in an abismal manner, and the public relations leave a lot to be desired. The impression that subscribers get from Prestel is one of "we couldn't care less about the residential users", and Micronet has behaved as if nothing they or Prestel do can possibly be wrong.

If either party feels that this is an unfair assesment of the situation then they should do something about improving their relations with the people who pay their wages – the subscribers.

Logging Off

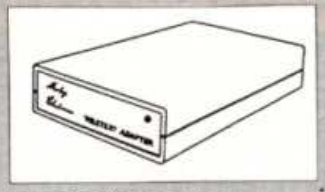
Next month a report on the Alpha modem from Watford Electronics and a review of the MicroLink multi-speed modem. I'll also be looking at the Musictel network of bulletin boards.

Any news for me? Please feel free to contact me at A&B, or mailbox me on Prestel/Micronet 011112564, or Telecom Gold/MicroLink 72:MAG95307

TELETEXT ADAPTER

Would you like access to free high quality software and over a thousand pages of information, but Prestel access charges and phone bills too expensive? Then read on!
The answer is Teletext. Yes the same system everyone has seen incorporated into television sets, but with a difference. When Teletext is read by a computer you can actually use the data.
The MORLEY TELETEXT ADAPTER introduces you to the world of Teletext at a price that won't break the bank. Inside it you will find the latest in second generation Teletext chip technology, which unlike our rivals who are still using chips designed more than ten years ago, will be fully compatible with any future advances in the Teletext system.
With the Morley adapter you will get a state of the art unit that automatically tunes itself into the required station (no more messing around with screwdrivers or twiddling little knobs in the back of the case), a user friendly menu driven program, easy to follow instructions and a 12 month warranty. Add to this the free downloadable telesoftware and we are sure that you will agree that we are offering you one of the best bargains on the market today.

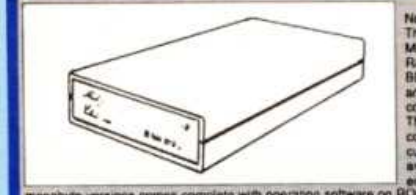
FEATURES:
* Advanced design uses the latest technology, will handle ANY future enhancements to the Teletext system e.g.: full field; 8 bit data transfer; 2k pages etc.
* Simply plugs into the user port.
* Low power consumption, less than 200ma.
Optional power supply available.
* User friendly menu driven software including extended OSCLI and OSWord commands for access from BASIC programs.
* Supplied with 16k ATS (Advanced Teletext Software) and 16k support ROM software inc. printer dumps, page spoolers etc.
* FREE Telesoftware, no access charges (updated weekly).
* Save selected pages to disc/tape for later retrieval.
* Full access to all Teletext services and channels e.g.: CEEFAX, ORACLE, 4-TEL.
* Gives you a real-time clock at your disposal (*TIME).
* Software upgrades to allow for any enhancements to the Teletext service, e.g.: extra channels, full field data on cable & satellite systems etc. (only the media charge).
* Easy to follow comprehensive user guides.
* No hardware limitations, it can for example receive virtually unlimited numbers of channels.
* Utils disc available including printer drivers allows pages to be selected and dumped direct to a printer



(no more TV or Radio Times to buy).

WHAT THE REVIEWERS SAID:
". . .In terms of price, performance, future expansion possibilities and those little touches that show thought for the end user I would recommend the Morley unit."–*(Acorn User, January, 1986).*
". . .The Morley unit has been designed to ensure that its operation is simple and smooth. It is the ideal Teletext adapter for school use."–*(A&B Computing, June, 1986).*
". . .Using it over a number of months in different schools, it has proved utterly reliable, and may confidently be recommended."–*(The Times Educational Supplement, September, 1986).*
THIS IS THE BIGGEST SELLING TELETEXT ADAPTER CURRENTLY IN PRODUCTION WORLDWIDE, AND COMES WITH A FULL MONEY BACK SATISFACTION GUARANTEE.

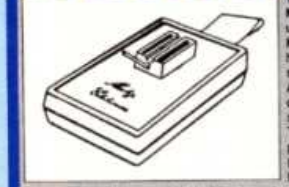
RAMDISC



Now available! The first true MEGA capacity RAMdisc for the BBC, BBC B+ and MASTER computers. This fully compatible unit, currently available in either 1 or 2 megabyte versions comes complete with operating software on ROM, power supply, and a comprehensive user guide.

FEATURES:
One megabyte of RAM connected to the 1mHz bus. Used with the supplied ROM software programs and files may be saved and loaded from the RAMdisc in the same manner as from a floppy disc with a large increase of speed, for example, a 20k mode 0 screen takes about 3-4 seconds to load from disc and about 0.2-0.3 seconds to load from the RAMdisc. The RAMdisc ROM operates as a utility ROM working with the current filing system rather than as a separate filing system. Therefore ensures compatibility with any Acorn compatible DFS (not ADFS). The RAMdisc can be selected by a * command to take the place of any drive number from 0 to 9. If the RAMdisc replaces a floppy drive as 0 for example, all commands addressed to drive 0 will be intercepted by the RAMdisc. The default drive number is 4. Any "Dangerous" *commands such as *COMPACT, *COPY, *BACKUP etc can be intercepted and the BBC's RAM from page 2 to &7FFF saved to RAMdisc workspace, and may be recovered using a *command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The filing system wedge ROM supplied supports load/save, byte file access, all relevant OSFSC commands, and contains a formatter verifier and 'sector' editor for use with the RAMdisc. Catalogue structure allows up to 2,688 files.
Well that's the spec., add to this our usual 12 month no quibble guarantee and we're sure you'll agree the Morley RAMdisc is the sensible alternative if increased storage capacity and speed is your requirement.

EPROM PROGRAMMER V2



The MORLEY EPROM PROGRAMMER V2 is a small self contained unit that plugs into the BBC or MASTER user port. It comes with a high quality ZIF (zero insertion force socket) and contrasting plastic case. Also included in the package is it's own user friendly menu driven software on ROM or disc.
This state of the art unit, allows programming of 2764 (8k), 27128 (16k), and 27256 (32k) EPROMS. Not only does the hardware allow programming of the usual NMOS devices, but will handle the new generation CMOS equally as well, and with the average time taken to program a 16k at less than 30 seconds we believe it to be one of the fastest programmers available today.

THE HARDWARE
The Unit is completely under software control, there are no knobs or switches to baffle the novice, and the extended features provided should excite the pro's.

THE SOFTWARE
The comprehensive user friendly software included in the package has two main parts, the first allows EPROMS to be read, programmed, verified and edited, also allowing a ROM image to be loaded or saved to disc. The second is a full ROM management system in its own right, which has a host of useful features and routines, such as KILL and RESURRECT ROM to disable or enable a sideways ROM, dump ROM image to buffer or disc, move ROM image in buffer to sideways RAM, and VIEW-SEARCH any sideways ROM.
The whole system is available now for less than the price of one WORDWISE chip. So get yourself the all new MORLEY EPROM PROGRAMMER V2 today and stop using those expansion boards for what they were made for! ROMS.
Immediate delivery no quibble 12 month guarantee.

MASTER CARTRIDGES

DUALS – Designed and manufactured by Care Electronics to Acorn specifications. These high quality Master expansion cartridges will take two 16k sideways ROM's, and will, unlike similar cartridges available from other manufacturers, accept the new second generation programs, such as Computer Concepts Interword and Spellmaster ROM's.
QUADS – As Duals but take 4 x 16 Eprom.
These Cartridges come in a high quality, robust, formed-plastic case, that fits neatly into either one of the of Master's cartridge slots.

MASTER SMART CARTRIDGE

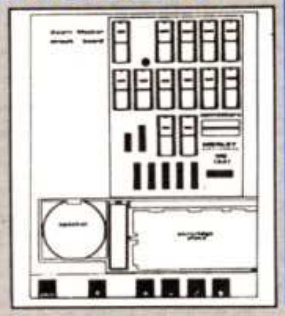
This device was designed and manufactured jointly by Morley and Care Electronics.
The **Smart** cartridge will at the press of a button halt any program running in memory and execute any one of a host of useful built in, or user defined procedures, and once completed will return to the program and continue where it left off. The only limiting factor with this device is the programmers imagination.
The **Smart** cartridge will prove useful to the novice, allowing him to do the simple things like dump any screen to printer, and made backups of protected tape or disc based software, but has an open ended specification for the advanced 'HACKER' allowing advanced programming techniques to be incorporated into almost any program at the touch of a button.

BUILT IN FEATURES (at the press of a button)
Autosaves computer's entire memory.
Freeze program at any point.
Screen dump (any mode) to printer or disc.
Allows any OSCLI command without disturbing memory.
Copies 90% of protected software.
Tape to disc, disc to tape.
User friendly menu.
Sound On/Off.

ALL CARTRIDGES COME WITH A 12 MONTH NO QUIBBLE WARRANTY

NEW PRODUCT

MORLEY MASTER BOARD 'AA'



At long last the add-on all MASTER users have been waiting for, an internal ROM board.
No more need to turn the computer off to insert the cartridge containing the ROM you need to debug the program in memory.
The new **MORLEY MASTER BOARD "AA"** allows you to have up to 8x16k and 4x32k extra Roms installed inside your MASTER and still leaves the cartridge slots free. This in effect allows your MASTER to support as many as 24, 16k ROMs installed permanently, whilst retaining the standard 4 x sideways ram banks and four banks by using cartridges.

A staggering 32 ROM images installed and accessible at any time

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Kenneth John

Time Machine

Once again I have had to take the lid off the machine to upgrade it. However I am pleased to have so done as on this occasion I have inserted what the firm Permanent Memory Systems calls *'an amazing little device'*. And I concur.

CLOCKING ON

The Master Compact learns to tell the time

'Smart Socket'

A little bit of a chip no bigger than a standard ROM and about as high as a grass hopper's knee, which is less than a centimetre! Inside of this is a permanent battery, well ten years life is claimed and in this world that's pretty permanent.

The RTC has the regulation *notch* which when the chip is correctly inserted will, as with all good MOS chips, be on the left. Switch on and type

***ROMS <RETURN>**

and the RTC should be confirmed on the list as RTC 00. Usual checks if this is not the case, with the usual essential precautions with regard to safety. If all else fails you are invited to telephone PMS. There's nothing like support.

Initialisation

A short process during which the clock is prepared for setting. Six * commands (Figure 1) are typed in followed by ***SETTIME** and the *day,month,year,hour, minute and second* exactly as instructed. I must admit I needed a couple of entries before I got the spaces, commas, fullstops and colons right. Follow this with

***TIME <RETURN>**

and the correct time should be returned.

Telling Time

The eleven * commands fall roughly into three categories. Firstly those which cause some function to occur, secondly those which are used to set before a function, and thirdly those which cause information to be displayed.

The functions are simply **on, off and cancel**. The difference between the last two being *off* implicates only one facility whereas *cancel* effectively puts all out of action at the same time.

Setting is, as it implies, setting an alarm at the date and time as appropriate.

Information provides a display of the status of a particular utility eg which of four possible alarms are set or unset.

Alarmed

No need to be as the RTC provides the user with four options which can remind you of that important event or crucial time. Two stages:

***ALARM**

displays the status and current settings

***ALARM (n) (time)**

sets the time for one of the available alarms. (Figure 2.)

The system has built in alarm flexibility in as much an alarm can be set for so far ahead up to 24 hours without using one of the *Alarm (n) options, or if the latter is used the alarm can be set to sound at the same time every day, or at a time on a specific day.

Compatability

PMS claim the facility is suitable for use alongside all other software which uses Master 128 RTC commands, in addition to its own GENIE pop-up software. I have no reason to doubt such a claim to-date. However I have found that there are some programs, especially games which, although they manage without using the *NOALARM facility, have behaved in a more friendly manner after this command has been issued. The RTC certainly has no ill effects on the word processor I use. The author of the few instructions necessary with this product recommends using the *NOALARM prior to formatting or compacting.

Technicalities

The essentials are stored in EEPROM so are not lost when the power is switched off. This is so even when *NOALARM as previously referred to, is used.

The RTC implements OSWORD (operating system routines) 14 and 15 similarly to the Master 128. This enables the facilities of the CMOS clock to be read from and written to BASIC programs in various forms dependant on the values written in to the parameter block.

Conclusion

Besides having the time displayed in the top right hand of the screen and being told it is five minutes to dinner when flogging away at the keyboard it seems to me that the potential for use is considerable, for example diary programs which require real-time to make them effective.

Believe this one or not if you can Mr Editor, glancing through other magazines as well as reading your own, I notice more and more packages, particularly those in the business world have the tell-tale images, in the top right hand corner of the screen. Anyway putting all this bull to one side, *I'm a little more up with the 'Archies' (get it) of this world now.*

Factfile

Compact Clock costs £35 and is available from PMS, 38 Mt Cameron Drive, East Kilbride, G74 2ES. ☎ 03552 32796.

Kenneth John mixes business and pleasure on his Master Compact and readily admits he still hasn't got around to using everything on the Welcome disc!

Figure 1

****CLOCKOFF<RETURN>***
****ALARM A OFF<RETURN>***
****ALARM B OFF<RETURN>***
****ALARM C OFF<RETURN>***
****ALARM D OFF<RETURN>***
****TIMER OFF<RETURN>***
****SETTIME ddd,nn mmm yyyy.hh:mm:ss***
Example Mon,20 Jun 1988.17:55:02

Figure 2

ALARM TIME
A: Every day at 17:55:00
B: Mon,27 Jun 1988.18:00:00
C: Alarm off D: Alarm off
Timer: 21:11:13 to run

Trevor Attewell

As many readers will know, Computer Concepts are on target to launch the first of their promised FAX packages at the PCW show in September. It takes the form of an add-on for the Archimedes (see last months news item), to be followed later by a PC version. These packages will have obvious applications where suitable computers are already in use, including many businesses. In the course of previewing the Archimedes system, it may be helpful to look generally at FAX and its origins, in order to put the whole subject perspective.

FAX FACTS

As the number of FAX machines in use soars and prices tumble, even the smallest business can benefit from installing one

Just picture it!

The only way to transmit text across the world was to telex it, and the only way to Telex a picture is by describing it. If you believe the old saying, this will take at least a thousand words.

Facsimile transmission ("FAX") started because news agencies, Police and others needed to get pictures urgently, anytime, from anywhere in the world. A variety of systems were used over the years by the "wire services", but their basic principles were similar. At the transmitting end the original was wrapped around a drum and scanned optically by a lamp and photocell combination which travelled slowly along the drum parallel with its axis. A "light valve", or chopper, was placed between the lamp and the photocell to modulate the light, typically at 2.4kHz. The photocell output was amplified, band-pass filtered and equalised, giving a transmission waveform in which the signal amplitude varied with the reflectivity of the original document. At the receiving end the processed signal was used to control the intensity of a narrow beam of light which scanned a sheet of photo-sensitive paper. This was wrapped around a drum, similar to that in the transmitter, and running at the same speed, synchronised by the modulation frequency. Early machines had poor resolution, even by newspaper standards, but the revolution in electronics made possible by semiconductors has changed all that.

Modern FAX technology is digital, with increased speed and better resolution. One important spur to its advancement arose from the fact that the Japanese do not have a true alphabet. Instead, they use a great number of written *Kanji* characters, each representing one or more words. These cannot be translated into numerical codes, and can only be used on typewriters or telex equipment in a complex and highly restrictive fashion. Given their expertise in electronics, it is small wonder that the Japanese have pursued FAX with enthusiasm.

A modern FAX machine can be very compact, and contains both transmitter and receiver. The transmission head, or scanner, is slightly wider than the original document, which it covers in a single pass from top to bottom. Either the paper can be fixed while the scanner moves, or vice versa. The underside of the scanner has a row of LEDs and an adjacent CCD linear image sensor, running parallel with one another across the width of the carriage. The LEDs are pulsed for each line to be transmitted, illuminating the original briefly. This causes a charge to appear in each of the 1728 elements of the CCD, the charge being determined in each case by the print density under the element. Before the next light pulse is generated, the CCD is read by clocking it with a train of pulses at about 40kps, much as a shift register is clocked. The internal charges are shifted along the CCD, element by element, emerging as a serial pulse train. The process is repeated down the length of the paper.

When receiving, the machine uses a second head, with thermal printing elements along its width, over which thermally sensitive paper passes from a roll held in the machine. Each element is energised or not, depending on whether the corresponding pixel on the paper is to be dark or light.

A matter of protocol

Somewhat to everyone's amazement the CCITT protocols for FAX transmission are accepted world-wide, so direct communication is possible between about 90% of all machines. The two current standards are designated Groups 2 and 3, the former being the older standard, now rapidly becoming obsolete, having only very limited compatibility with Group 3. For Group 2 and Group 3 (Standard) the resolution is 200 pixels per inch horizontally by 100 lines per inch vertically. There is also a Group 3 (Fine) with 200 x 200 resolution.

Protocols for a new Group 4 are under discussion, although machines will not be around for several years yet. The main reason for the delay is that they will only work through fully digital exchanges, which are confined to a limited number of telephone areas at present. It will be faster, with better resolution, and possibly with colour capability, and will be downward compatible with Group 3 (and as yet do not work properly).

From the figures given above for Group 3, it can be seen that the total possible number of pixels per A4 page is 1728 pixels/line x 100 lines/in x 11.25in, which amounts to about 240Kbytes, allowing 8 pixels (bits) per byte. This is a lot of data, and in practice is compressed as it is read, using the kind of run-length encoding familiar to all savers of graphics screens. In this case the compression algorithm is optimised for the most typical density distribution found in documents, eg an average printed or page.

This can reduce the amount of data quite dramatically, so that a printed A4 page with well spaced text can be read at 9600 bits/s in about 15 seconds. For documents which do not conform to the optimum pattern this time is increased. For example, pictures that require fine detail can take six minutes or more to transmit.

Down a bit your end!

It may seem curious that FAX does not use any error checking during transmission, though corruption is common. The two FAX machines do a little hand shaking before the transmission, during which a transmission rate is agreed, starting at 9600 bits/s and reducing the rate until hand shaking is satisfactory. If there is corruption during trans-

mission, no correction can be applied. Instead, the receiver (which incorporates some short term line storage) checks that 1728 pixels have been received before each end-of-line signal. Depending on the result of the test, the line may be printed as received, it may be replaced by a copy of the previous line, or it will be left blank. In the worst case reception will be terminated. Individual FAX machines differ considerably in the degree of intelligence with which they identify errors and react to them.

Archiefax!

The idea of using an Archimedes for FAX transmission and reception is attractive, not least because it removes the need for a separate machine, thereby reducing the cost substantially. The source material can be generated in the computer as a text file or graphics screen, and incoming documents can be printed by the dot matrix or laser printer which most owners will already have. Where there is a choice between 9 and 24 pin printers, the latter is preferable.

The necessary electronics occupies a half-width podule. Like all podules this requires an on-board ROM containing a relatively small amount of management code, and the rest of the ROM can conveniently hold the FAX software. The latter can take an ASCII spooled output from any wordprocessor, and convert it to standard Group 3 FAX. It can also handle graphics screens. The page to be transmitted is displayed on the monitor screen in a WIMP environment, and can be scaled up or down in size, while a pixel editor takes care of fine tuning.

The finished result can be saved (and subsequently reloaded), sent as a FAX transmission, cropped (to allow a part of it to be sent), and downloaded to a printer. When sending, a menu provides auto-dialling by number or name, and the dial option can be used independently. There is also an auto-answer facility. All telephone tones can be heard on the Archimedes loudspeaker, for which purpose Archie has had to be BT approved. The reason given, believe it or not, is BT's need to ensure that there will be no sudden loud noise which might frighten somebody! The telephone connection will be made by a flying lead from the module, terminated by a standard telephone plug. This must be a fixed lead, under BT regulations. A two-way adaptor can be used, so that the same line can be shared by a normal telephone.

Roll me over

To read originals not created in the computer, Computer Concepts will supply an optional, hand-held scanner, made by Mitsubishi. This is the first one of its kind to cover an A4 sheet, and CC are the first to use it in this way. It occupies a plastic moulding, somewhat wider than an A4 sheet, which runs over the document to be read. Long rubber rollers under the head keep it running on a straight track very effectively. The output is connected by cable to a socket on the podule.

The hand scanner works in just the same way as in a stand-alone machine, and the data is stored in the Archimedes RAM, for which reason a 305 is not suitable, but a 310 or 400 series is.

Another advantage of the Computer Concepts FAX module is that it can recognise whether or not it is talking to a similar module at the other end. If so the FAX protocols will be dispensed with, and full error correction will be applied. Furthermore, it becomes a simple matter to send files of any type, including previously dumped screens, digitised video pictures and so on.

What does all this cost? The provisional price for the module is £499, plus £300 for the scanner, both excluding VAT. This may well be too rich for the average hobbyist, but the equipment is really aimed at the business and education markets, which should find its extensive features attractive, and the price well below that of comparable stand alone FAX machines. Next month I shall then be reviewing the final product.

Factfile

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NEWSPAPER

NEW HEAD NEXT TERM

St Trinian's awaits with baited breath the arrival of a new head-mistress next term. Mrs Pringle joins us on January 9th. She is looking forward very much to a spell at St T's.

Mrs Pringle, mother of 12, has had a long, successful, and most colourful career at Bash Street School. She has a life-long interest in martial arts. "Most useful in the classroom" she told our roving reporter. "I look forward to using them frequently at St Trinians" she said.

Mrs Cynthia Pringle's exceptional career, punctuated only by short holidays "at her majesty's pleasure" as she puts it, has often been the subject of discussion in the press - usually the Sunday press. Mrs Pringle has already gained an amazing reputation. The school awaits her arrival with interest.

Head hunting at St Trinian's

Cook batters fish-p7

Scandal rocks potting shed!

Scandal came to the quiet cloisters of our beloved school yesterday, when Higgins, the school gardener, was found to have spent the whole school's gardening budget in the Knockit and Pocket Billiard saloon.

"Just doing a little early potting" said Higgins.

STOP PRESS

Hockey team slays Saint Ursula's...

St T's hockey team made mince-meat of the opposition today. The scene on the school fields was chaotic.

Hot mince pies

at tuck-shop now!

Third years win £91,000 on pools!

William Benjamin

Extending your school's computer facility

The Nimbus is a 16-bit computer launched in 1985 by the Oxford-based Research Machines Ltd primarily for the education market. Briefly, the system comprises three 'boxes': a computer, monitor and separate keyboard – a configuration familiar to Archimedes and compact users. The basic Nimbus PC-186 system, sports 512K or 1Mb of RAM and an integral 3.5in disc drive – each expandable with additional memory or floppy/hard disc

BASIC ABROAD

Does the RML Nimbus offer an upgrade route for schools using BBC Micros?

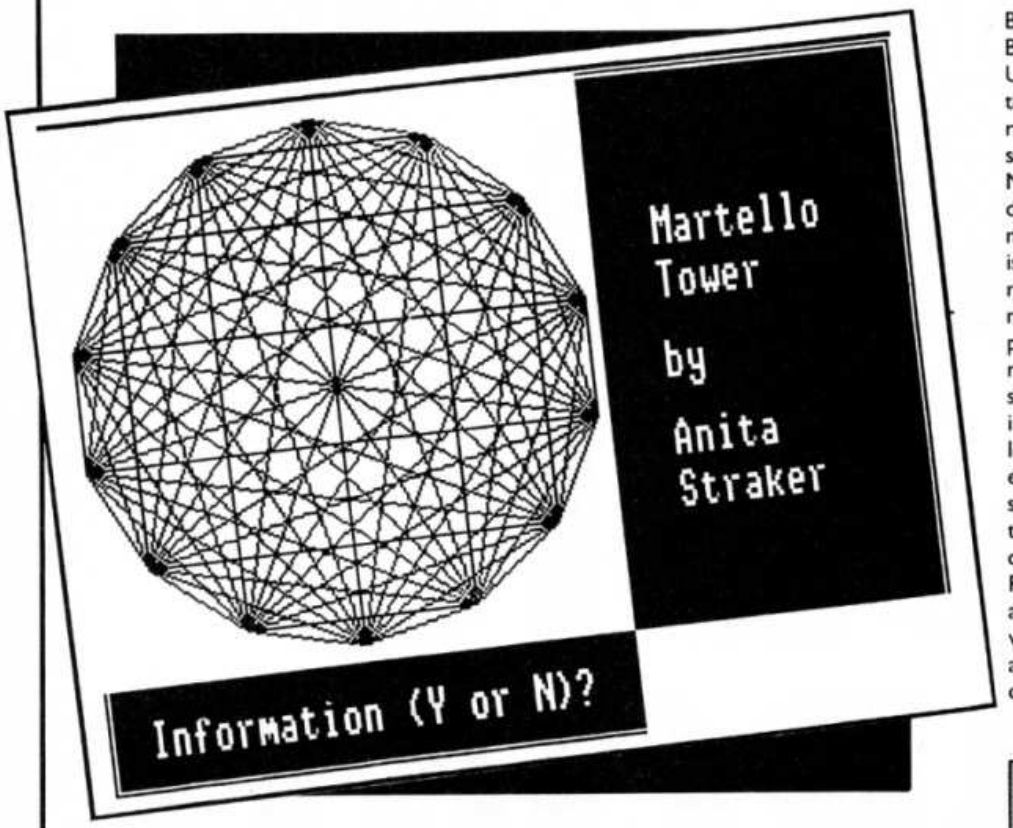
options. The Nimbus also sports a very versatile PICONET interface (RS422), a serial port, an optional BBC style parallel port and mouse/joystick port. Apart from its appearance you might be forgiven thinking that the Nimbus is a BBC Master 128 look-alike, but you would be quite wrong. This computer is based on the 80186 processor and is far more like an IBM PC than any Acorn micro. Similarly, its operating system is MS-DOS, familiar to all PC-COMPATIBLE owners. Why then discuss the Nimbus in A&B Computing I hear you ask?

At the present time the National Council for Educational Technology is conducting official tests on various 16/32 bit micros to check (amongst other criteria) compatibility with commonly used classroom packages. LEAs too, are currently reviewing their own computer hardware and software strategy for schools. The important task being to provide powerful computer systems for children of the 1990s without sacrificing too much existing educational software in common use.

Many schools have invested a great deal of INSET time and capitation/PTA money in obtaining a sound software library. Many will require more hardware as teachers become more 'computerate' and wish to use computers in their classrooms. However, individual schools (and authorities), are faced with a difficult choice: the trusty but outdated model B is no longer available. Realistically, the alternatives are the Master 128, and the Compact, the Archimedes being still out of the price range for many schools. The Master 128 is not wholly compatible with pre-1986 software and is still relatively expensive as a disc drive must be added to the BASIC cost. The Compact overcomes the problem of the disc drive, but this is a 3.5in unit so all pre-1986 software must be converted.

This has freqently proven to be a technically difficult task and one that few busy teachers will undertake. Since Acorn now sell the Compact to schools with the Mertec Companion things are a little better as a 5.25in disc drive can be added and DFS may be installed to run BBC B software. This makes the Compact a more attractive proposition for primary and lower-secondary education sectors. However, the Compact Companion sports a 2MHz bus (not the standard 1MHz), and this means that any peripherals using this interface will not work! Just to complicate matters, each of these later Acorn micros has operating system differences which can upset pre-1986 software.

To their credit, almost all software publishers now produce Master and Compact versions of their popular software so the situation is not so bad for those monied institutions who are prepared to invest in later versions of the software.



Why the RM Nimbus?

Some authorities/schools may decide that this is the time to take advantage of the additional computing power offered by 16-bit machines. Although the Atari ST, Commodore Amiga and Amstrad PC all look attractive in price and specification, the availability of sound, educational software for these machines is **very** limited.

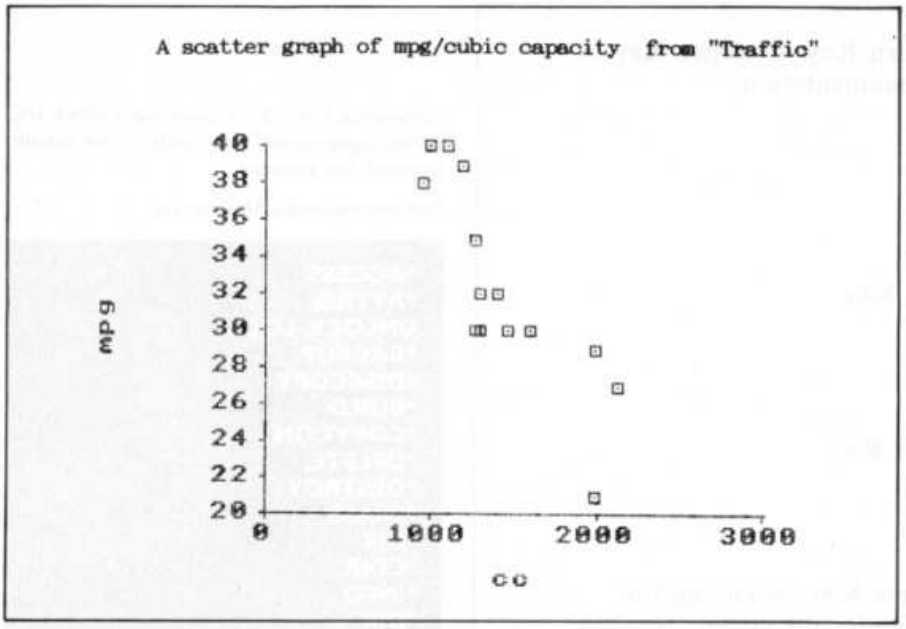
The 16-bit computer gaining most popularity in our schools at present is the RM Nimbus – its ever expanding software catalogue testifies to the fact that more publishers than ever are writing or adapting software for it. Perhaps more than any other factor it is the release of BBCBASIC(86) and the BBC style parallel port which positively encourages traditionally, BBC software developers and programmers to write (or adapt) software for the Nimbus. At last there is a gentle means of becoming familar with this capable computer without having to relearn from scratch.

BBCBASIC(86) on the Nimbus

BBCBASIC(86) is a full implementation of BBC BASIC, emulating screen, keyboard, User Port, Printer and Analogue/digital Ports to high degree of compatibility. In fact it is rather uncanny to see all the familiar prompts, screen modes and keypresses operating on a Nimbus computer. The package comprises a disc of software and an extensive reference manual and a compatibility guide. On the disc is a compatibility checking program which reports any incompatible commands/statements and structures found in a BBC file. To permit a BBC program to be altered if required, an ASCII conversion program is supplied. This converts the BBC program into ASCII format from which it can be loaded into a suitable word processor for editing. File transfer programs are also supplied which permit BBC software to be transferred to a Nimbus via a suitable connecting cable. I was not able to test any of RML's disc transfer kits as these were not available at the time of writing. However, I was able to transfer programs via the RS423 and Nimbus serial port using a proprietary cable as described later.

BBCBASIC(86) comprises four elements:
1. A BASIC interpreter
2. The ASSEMBLER
3. An OPERATING SYSTEM interface
4. SCREEN MODULE

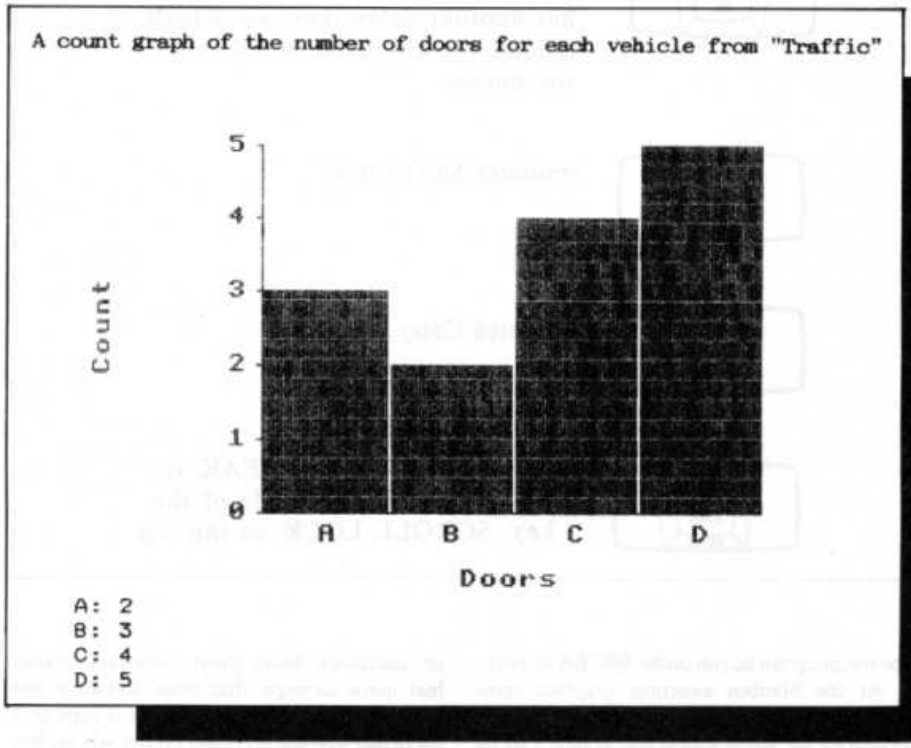
The BASIC interpreter deals with the non-hardware dependent parts of BBC BASIC. It appears to be closely compatible with BASIC4 on the Master 128 and includes several of the enhancements in BASIC4. The ASSEMBLER in BBCBASIC(86) includes an assembler appropriate to the 80186 processor and is naturally different from the BBC's 6502 assembler. In practical terms this means any assembler (machine code) in BBC software will not run on the Nimbus under



BBCBASIC(86). This is a major area of incompatibility.

The OPERATING SYSTEM interface very cleverly provides a BBC OS 1.2 environment enabling interaction with MS-DOS to take place. It also allows many 'star' and '*FX' commands to be included. The User, A/D and printer ports are functionally emulated in the OPERATING SYSTEM interface. The SCREEN MODULE provides an emulation of the BBC Micro's eight screen modes, including MODE 7 and the VDU driver. Many of the graphics facilities on the Master series are included and as the Nimbus offers enhanced graphics facilities, these have been made available as well eg, access to the Nimbus's 16 colours.

Almost all the keyboard functions are correctly emulated in this module although not unnaturally some of the Nimbus's keys don't match the legends on the BBC Micro's keyboard! The diagram shows the Nimbus's substitute keys. A high degree of compatibility is demonstrated by the fact that BREAK key is supported and so is SHIFT+CTRL to control scrolling. Even the BBC's COPY key screen editing is emulated.



BBC to Nimbus

Obviously a disc transfer kit is the better means of transfering BBC files to a Nimbus but this is quite expensive and possibly only appropriate to those with a lot of files to transfer. I used a serial transfer lead made by Connections and the utilities provided on the BBCBASIC(86) disc. The cable plugs into the the Nimbus's Aux/PICONET port and the Beeb's familiar RS423. The Nimbus Aux port must be configured to I/O at 1200 baud with CONFIG (a file on the Nimbus Welcome Disc). File transfer requires a BBC BASIC program in each machine. TRANS.BAS is sent to the BBC first before FILERECV.BBC is loaded into the Nimbus – these are both supplied on the BBCBASIC(86) disc.

The BBC must be initialised to receive TRANS.BAS. This can be achieved simply by: *KEY0 NEW"M*FX7,4"M*FX2,1"M <RETURN> Pressing f0 and entering: COPY TRAN.BAS COMB <ENTER> on the Nimbus results in the transfer program being copied into the BBC's memory. Once installed it can be saved to disc in the usual way.

At the Nimbus end BBCBASIC(86) is loaded and the file FILERECV.BBC run. Following the prompts the file to be transferred is copied into the Nimbus's memory. From this point the file can be saved as it is (taking the extension .DFS), or, if it is a program, converted into BBCBASIC(86) format (taking the extension .BBC). The process is smooth and simple to follow. Once transferred programs converted to BBCBASIC(86) format and text files are ready to run under BBCBASIC(86). However, numeric data files, mixed numeric/data files and those transferred program file not previously converted by all need to undergo a conversion process to translate their tokenised format to that understood by BBCBASIC(86) . This is achieved by FILECON.BBC another utility on the BBCBASIC(86) disc.

Files from the Nimbus must be converted into ASCII format before being transferred to the BBC. This process simply changes files into a format that is readable by nearly all computers.

Compatibility

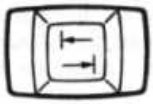
This is a major issue of course, as the degree of compatibility will depend on whether a file will be worth the trouble it takes to convert it to a successful BBCBASIC(86) implementation. RML's BBC Compatibility handbook describes a number of areas which may be problematical and a few guidelines provide an indication whether a program will require modification. Here are a few tips on how to ensure BBC software portability.

– If any program relies on BBC hardware then it won't run at all. Thus any 6502 assembler must go. Similarly, incompatibilities will arise if programs rely on operating system features not supported by BBCBASIC(86).

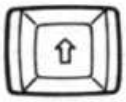
– frequently BBC software utilises indirection operators '?' and '!' to POKE and PEEK at memory locations. These must be removed from a program. For example, ?&25A initialises the BBC's keyboard status. It must be removed from the software and the *FX equivalent substituted. Similarly, ?FE60 'looks' at the User Port. This must be removed and *FX150 and *FX151 substituted.

– Some earlier BBC programs of too great a length to fit into a DFS machine relocated themselves to PAGE &E00 by a downloader routine. Simply delete such routines in order

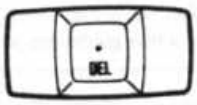
is the Return Key (or Enter Key in Nimbus documentation)



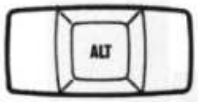
is the Tab Key



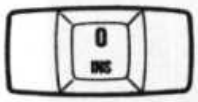
is the Shift Key



is the Delete Key, removing the character under the cursor. Nimbus has another delete key ← which deletes the character to the left of the cursor.



emulates Shift Lock



emulates Copy

is the Break Key - BREAK is written on the front side of the key, SCROLL LOCK on the top.

for the program to run under BBCBASIC(86).

– As the Nimbus executes graphics commands more quickly than the BBC Micro, be prepared for some sound and graphics to be unsynchronised in the converted program. Similarly, the programs using loops to time activities may no longer be accurate. Timing checks may need to be added to the software.

– Programs with sideways scrolling are not supported by BBCBASIC(86).

– About 40 BBC BASIC keywords work differently under BBCBASIC(86). These are described in the Compatibility Guide.

– BBC BASIC programs should be edited under BBCBASIC(86) to ensure that long lines and embedded graphics characters will be preserved. Often removing these characters results in a program not running correctly.

This list is not exhaustive and the Compatibility Guide explains the issues in far more detail. One point which does arise however, is that of the transfer and editing of commercial software. The primary concern is that of copyright violation. But even with a publisher's consent, do not expect much help or assistance from them. Software houses feel quite strongly that their software was sold with the understanding that it runs on a particular computer(s) and on the whole, few will entertain being telephoned repeatedly in order to help solve a BBC-Nimbus transfer problem not of their making! Many feel the same regarding transfer of BBC/Master software to the Archimedes' 6502 emulator.

The problem arises if every school produces a slightly different Nimbus version. RM's advice to schools is that they contact the software house concerned, requesting a Nimbus version of the software required. If there isn't one perhaps the school can help in the development of a version. RM are happy to advise on the matter. I suspect that most teachers will opt in the short term, to transfer a few, possibly older programs now no longer available and gradually purchase native Nimbus software when funds become available.

Operating System

Although the BBCBASIC(86) interpreter recognises and acts on most of the BBC 'star' commands, there are a good many which are either implemented differently or are totally omitted. For example:

Not implemented Alternatives

```
*ACCESS
*ATTRIB,
UNLOCK, LOCK
*BACKUP
*DISKCOPY
*BUILD
*COPYCON
*DELETE,
*DESTROY
*ERASE
*DIR
*CDIR
*INFO
*DIR
*TITLE
*LABEL
*TV
*VIEW
```

As the table above indicates, the alternatives use MS-DOS formats. The Compatibility Guide contains a full list of *FX/OSBYTE commands. Many *FX commands have been implemented and often where there is no *FX equivalent in BBCBASIC(86) it is ignored. The guide lists those 'star' commands which are:

- The same as BBC BASIC
- Those which are different
- Those which are omitted (eg cassette interface commands)
- Additional commands permitting use of of some of the Nimbus's features.

The Screen

One major screen difference between the BBC Micro and the Nimbus is the vertical pixel resolution. The BBC can display 256 pixels vertically but the Nimbus has only 248. Table one indicates the differences:

In Modes which have 32 possible lines of text only 31 rows are shown on the screen: the top line is usually not visible on screen. However, the bottom line can be selected instead by *VIEW n. When n=1 lines 0-31 are visible until the screen is scrolled. When n=2 this holds the lines 0-31 in screen and the screen cannot be scrolled; n=0 puts the default screen of lines 1-32. The BBC's 16 colours (eight steady and eight flashing), are faithfully reproduced as the default colour range. However, the sixteen colours available on the Nimbus can be made available via the BBCBASIC(86) command *UNFOLD. *FOLD restores the BBC range. Table two shows the possibilities.

Printers

This is possibly the one peripheral that causes more headaches than any other. But if one is

to do anything worthwhile with a computer, hard copy is desirable. Parallel (centronics) printers can be driven through the Nimbus parallel Piconet module using BBCBASIC(86) commands. To do this requires the initialising of a parallel Piconet module. The Compatibility Guide describes the steps necessary to achieve this. It is rather long winded and appears just a little complicated but on-screen prompts do help (an alternative is to use the parallel I/O port). The newly configured Piconet module can be made permanent if required. Once BBCBASIC(86) is installed the printer can be switched ON/OFF with CTRL B/CTRL C or by the usual VDU2/VDU3.

BBCBASIC(86) Conclusions

One cannot be anything other than very impressed with RML's implementation of BBCBASIC(86). The range of features available, the number of low level Operating System commands and the ability to utilise the Nimbus's own features add up to a totally professional job. All the necessary manuals are supplied and they are well written and immediately comprehensible to anyone with more than a very basic knowledge of computing. Furthermore it is very pleasing to see so many good features of the Master 128's BASIC4 implemented.

BBCBASIC(86) is not just a language for the Nimbus but an environment which is remarkably similar to that of the BBC Micro and despite hardware differences it makes the Nimbus quite easy to get to grips with, as an increasing number of software publishers are finding. The next section looks at a number of titles which run under BBCBASIC(86) and where applicable compares them with their BBC derivatives.

Off-the-shelf Software

A number of traditionally 'Acorn', educational, software publishers have taken the first steps in producing Nimbus software. Cambridgeshire Software House, Fernleaf, Northern Micro Media, LTS, RESOURCE among others have all produced new or adapted software in the past year.

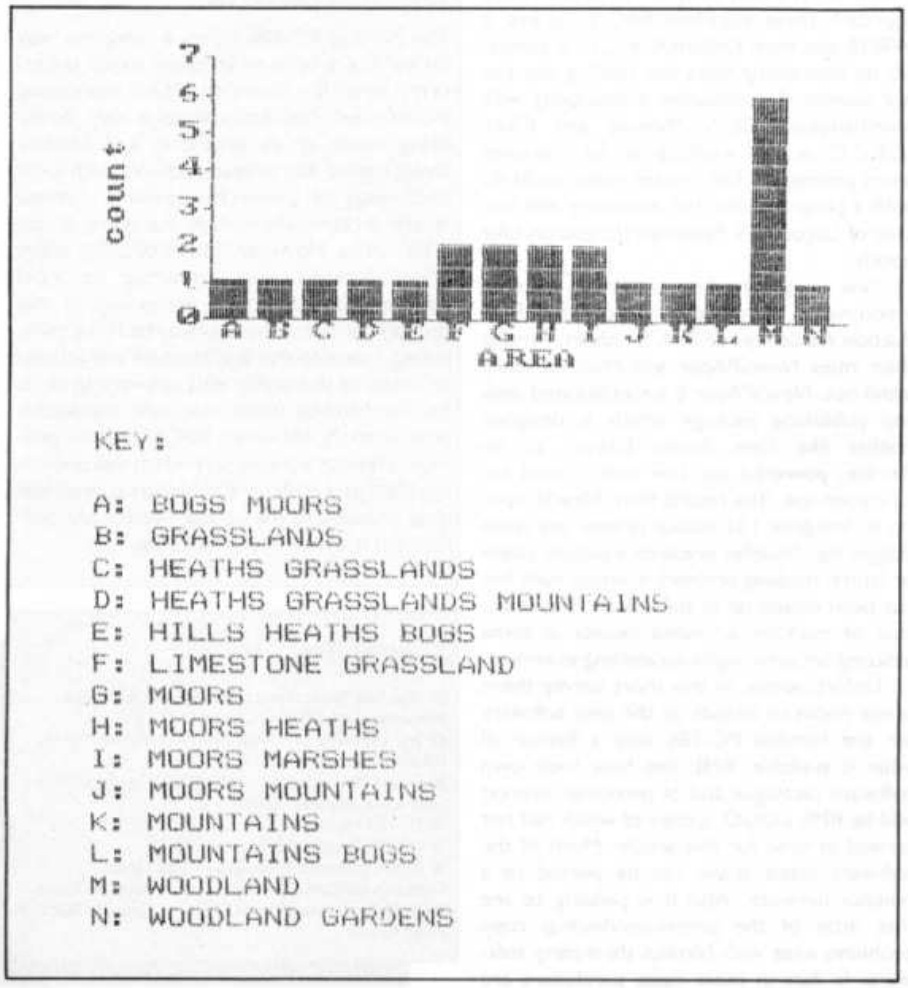
Fernleaf have versioned three of their popular titles: *Fletcher's Castle, Norman England* and *Viking England* all running under BBCBASIC(86). The main differences appear in the maps which are enhanced by the extensive use of colour in the Nimbus versions. Cambridgeshire Software House, on the other hand, have gone for complete rewrites of most of their current software and although one or two titles run under BBCBASIC(86) many of the differences are modest and cosmetic. *Princess And The Ring* however, does not and although it faithfully follows the BBC version, it benefits from better speed, and improved graphic screens. *Can You Find It?* and the popular *Police-Language In Evidence* are also rewritten for the Nimbus and their graphics displays too benefit from being clearer with a wider range of colours.

Their only totally Nimbus inspired title is *Primary Spreadsheet*, an introduction to spreadsheets. The sheet comprises a grid of 16x10 cells and all numeric data can be displayed as bar charts, frequency charts, line graphs and pie charts. All output can be sent to an EPSON compatible printer.

Northern Micromedia have a number of Nimbus programs. Two favourites are *Yellow Brick Road* and *Toy Quest*. The former title comprises a resource pack of materials (artwork, activities and games), to form part of topic based on the story of The Wizard Of Oz. Running under BBCBASIC(86) it features simple Mode 7 graphics: a delightful adventure for top-infants/lower-juniors. *Toy Quest*, another adventure, is written for the Nimbus and features simple, windowed, high resolution graphics. It features problem solving, and encourages children in discussion, co-operation and decision making. Aimed at junior-aged children, the pack contains art work, map cards, worksheets and a comprehensive guide for teachers. Both of these packs can be recommended. As you will not see any of the superb 4Mation adventures for the Nimbus (only *Granny's Garden* has been rewritten by CEAU of Kent), adventure software of this type is most welcome.

Inner London Educational Computer Centre (I.L.E.C.C.) market a number of quality programs for the Nimbus, among which are two rather good adventures from Anita Straker which run under BBCBASIC (86). *Martello Tower* is a mathematical adventure for the over eights. It contains ten mathematical problems which must be solved to complete the adventure. To allow practice, each problem is fully documented and there are 12 worksheets in the pack. *Puff* is set in the traditional adventure mould with a Pagoda to be explored and mathematical problems to be solved. Success in this program relies heavily on the mapping element. As this can prove difficult for younger children a master plan can be photocopied. A certificate is also available as added motivation and reward. A number of titles familiar to BBC Micro owners are available through I.L.E.C.C. for the Nimbus eg *Picture Craft, Smile – The First 31, Smile – The Next 17,* and *Mallory Manor.*

Other familiar titles available from Newman Software are *Grass* and *Grasshopper. Grass* is an database management package aimed at top junior/lower secondary children. Through its system of menus and query language, *Grass* has a well-deserved reputation



:	A	B	C	D	E	F	G	H
00:	*SALES*	*Mon*	*Tues*	*Wed*	*Thurs*	*Fri*	*Total*	*Price*
01:	*crisps*	23	34	19	20	35	131	12
02:	*peanuts*	12	9	11	15	13	60	17
03:	*mars*	16	24	15	23	0	78	20
04:	*bounty*	10	8	13	12	0	43	18
05:	*lollies*	34	45	44	38	34	195	2
06:	*drinks*	25	34	25	35	47	166	15
07:	*biros*	6	4	5	3	5	23	10
08:	*rubbers*	2	0	1	3	2	8	12
09:	*pencils*	4	3	0	4	5	16	6
10:	*rulers*	2	4	1	1	3	11	25
11:								
12:	*food sales*	120	154	127	143	129	673	84
13:	*stat.sales*	14	11	7	11	15	58	53
14:	*total*	134	165	134	154	144	731	137

for being very user friendly. It employs a range of graphical displays for information depending on the field type: histograms, cumulative graphs, scatter graphs pie charts and count graphs. Statistical information is provided by an averaging and median facility. It can be mouse driven and has a maximum record size of 4096 (eg 20 fields x 200 records). *Grass* allows you to search the information by looking for 'keywords' and this even extends to being able to search whilst editing – a rare feature. Being able to add extra fields is a boon. *Grass* comes with a number of handy datafiles. If your school uses *Grass* with its BBC Micros it would make good sense to purchase the Nimbus version if you decide to upgrade. *Grasshopper* is a spreadsheet for primary aged children which aims to promote the exploration into the use of spreadsheets as problem solving tools. In the best traditions of *Grass*, the program is menu driven and very friendly to use. It features a fast, clear display using coloured coded cells to indicate whether the contents are labels, data or formulae. One thoughtful feature is *Grasshopper's* ability to be reinstated to its previous state after any operation. There are built in graphs (line, pie, bar, scatter, count), and a sort facility. The wide range of sample datafiles included are extremely helpful in understanding spreadsheet applications and possibilities it offers. They range from 'tuck shop' sales figures and traffic surveys to number patterns and tables squares. *Grasshopper* is an impressive package and is the best available for the primary age range.

Front Page Extra is another Newman Software publication which should be very familiar to BBC users as it has been available for some time now. The Nimbus version offers a number of improvements such as wide or narrow subheadings, but in essence is the same as the BBC version.

Oxfordshire County Council produce a wide range of software for the Nimbus. Among their titles for Top Middle school/ lower secondary age range, DIG really stands out. This program together with its support materials, enables the teacher to simulate an archaeological excavation in the classroom. Based on a real excavation carried out at Claydon Pike (Gloucestershire), DIG helps children really appreciate methods of excavation, recording and analysis. It is better than anything comparable on the BBC Micro. However, to run it effectively you really need 5-8 Nimbus computers!

The Nimbus really suffers from not having a child-centred word processor like *Folio* or *Pendown*. The only program to even vaguely approach these excellent BBC programs is WRITE also from Oxfordshire C.C. It possesses no interesting fonts nor spelling checker nor planner. This situation is improving with Northampton C.C.'s *Myword* and *Chad*. I.L.E.C.C. is also working on an improved word processor. The system really could do with a program with the versatility and low cost of Logotron's *Pendown* (Logotron take note!).

One company whose name has become synonymous with quality is Software Production Associates or SPA for short. Among their titles NewSPAper and *Muddles* really stand out. NewSPAper is a sophisticated desk top publishing package which is designed (rather like Fleet Street Editor), to be flexible, powerful yet low cost – ideal for education use. The results from NewSPAper on an Integrex 132 colour printer are quite staggering. *Muddles* presents a puzzle, poem or lateral thinking problem in which each line has been mixed up in some way. The selection of muddles provided results in some amazing decyphering/unscrambling exercises.

Unfortunately, in this short survey there is not room to include all the best software for the Nimbus PC-186 only a flavour of what is available. RML also have their own software catalogue and of particular interest will be RML LOGO, a copy of which had not arrived in time for this article. Much of the software listed above can be ported to a Nimbus network. Also it is pleasing to see that little of the protection/backup copy problems exist with Nimbus third-party software. In fact in most cases purchasers are positively encouraged to make a 'working copy' of the master disc, putting MS-DOS system onto it in the process (to enable autobooting).

RM produce a full software catalogue for the Nimbus and a separate primary software catalogue. Each contains a full description of software, minimum hardware required and publisher.

Conclusions

The Nimbus PC-186 offers a complete way forward at a time when there exists uncertainty over the direction school computing should take. The Archimedes is only slowly being taken up at secondary and tertiary levels leaving the primary schools with 8-bit technology for some time to come – unless Acorn substantially reduce the price of the A300 series. However, BBCBASIC(86) offers a way forward which preserves the main traditions of educational computing in this country yet opens the doorway to 16-bit computing. I suspect that few teachers will actually be prepared to transfer BBC software to work on the Nimbus unless they are competent programmers. However, BBCBASIC(86) provides a familiar environment which will encourage third party software publishers to translate their products to the capable Nimbus and perhaps this is where its real value lies.

Factfile

- **The RM Nimbus is available from Research Machines Ltd, Mill St., Oxford OX2 0BW.**
- **PC-186 entry system (colour monitor and 512K RAM) £699.00.**
- **(education price) BBC BASIC(86) (supplied free with RM networks) £29.00.**
- **BASIC Manual £15.00.**
- **BASIC Compatibility Guide £2.50.**
- **Serial Transfer Cable is available from Connections Computer Systems, 22 Brogden Close, Raleigh Park Road, North Hinksey, Oxford, OX2 9DS Price £19.00.**

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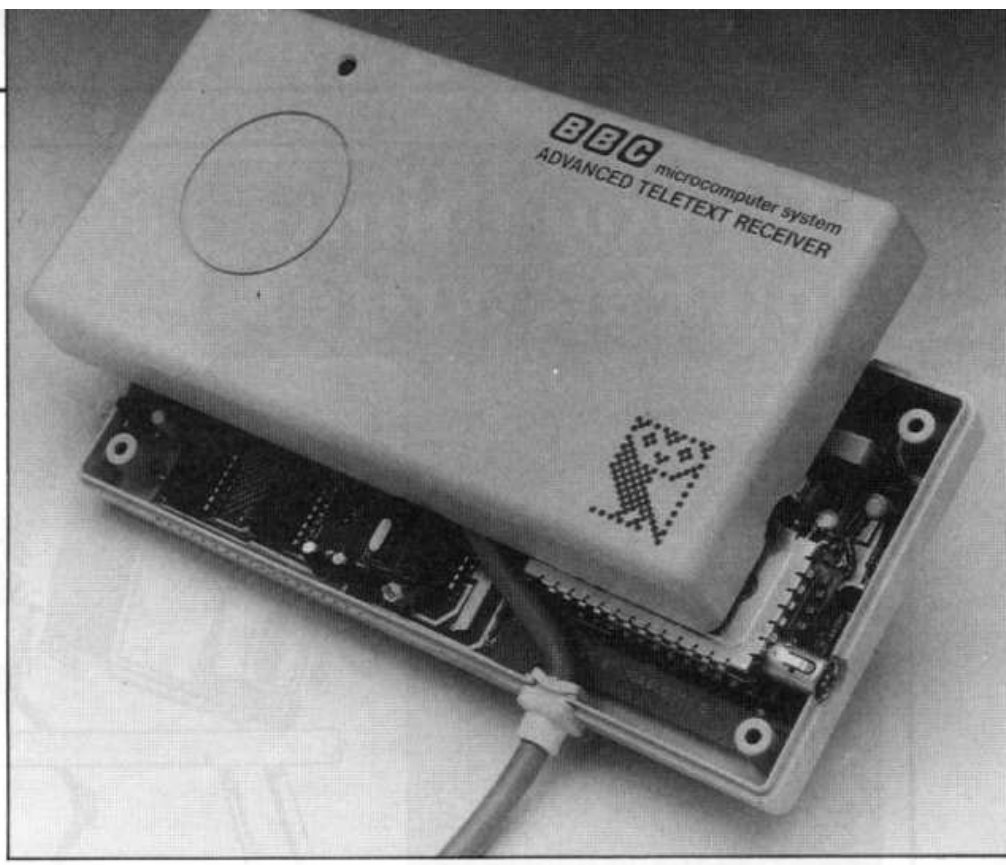


ON THE AIR

We've had Advanced Telesoftware for some time. Now there's an Advanced Teletext Receiver, built by GIS, approved by the BBC

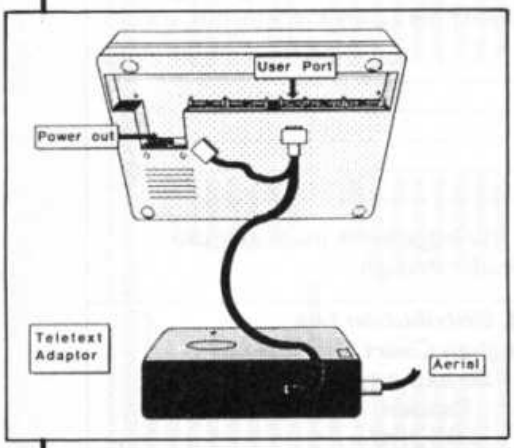
Although teletext services are not new to the BBC Micro owner, only now are they promising to deliver. The mini-computers which are behind the service are about to be upgraded, Amstrad CPC and IBM PC software is supported and reception hardware is available for a wider range of computers. BBC Micro owners are best placed of all to take advantage of these changes.

The Advanced Teletext Adaptor (ATR) from GIS is a much neater unit than the original Acorn design which was unweildy. It's compact enough to be mounted on a wall or desk and a bracket is supplied for this purpose.

The adaptor is designed to be powered, like so many other devices, from the auxiliary supply of the BBC Micro itself. However, for those many people with a disc drive also powered in this way, a "splitter" – two devices to one auxiliary socket – is not supplied.

Forewarned is forearmed. If you order this unit, order a splitter simultaneously and avoid the frustration of not being able to use disc drive and adaptor in conjunction immediately. Master Compact owners are stymied totally by this power supply problem although, with a Compact Companion attached, the ATR might just have worked!

The ATR connects to the user port at the computer end, to an external aeriel point at the other. You can view teletext on your normal television – but not in conjunction with picture television – or on your computer monitor.



Installation.

Tuning in

The ATS (Advanced Teletext System) software is supplied on ROM. It consists of a number of star commands, a terminal to Ceefax and Oracle services and a telesoftware downloader.

A number of facilities are available via function keys in the terminal. There's automatic tuning when you first start. The software scans intelligently for a station and can be tuned to eight separate channels, by no means overkill with the promise of many more channels in the near future. Different ITV regions also carry unique local information you might wish to access.

The terminal handles input from the user in the form of a channel request (only four on function keys), typed page number or the press of a single function key acting as one of four "link" buttons. The latter save typing the page number to a page closely linked by

subject matter to the one currently displayed. Access to link pages is also faster because they are held in a memory buffer.

You can hold a page display, reveal any hidden message (used for jokes etc), search for a subpage, go to the next or previous page, type an operating system command and go automatically to the main subject index. If you wish to store information then you can save a page to the tape or disc filing system and retrieve it for comparison. A function key is also setup to issue a *TTXPRINT if this software is installed.

A further sophistication in the terminal is "kept" pages. Any selected page can be *kept* by pressing the <COPY> key. Between 7 and 11 – depending on memory – can be kept in this way. They are loaded without user intervention and are available for immediate display, as opposed to the usual brief wait for the system to "get around to" your selected page.

TUNING CEEFAX 151 Tue 6 Oct 19:48:44
Station 1
UHF channel 58
Index page 100
Status On-tune
TSDP BBC1 CEEFAX
Select option
Press 5 Auto-scan for next station
Press 1 to 8 to select a stored station
Press K to store this station
Press SPACE to exit

Tuning.

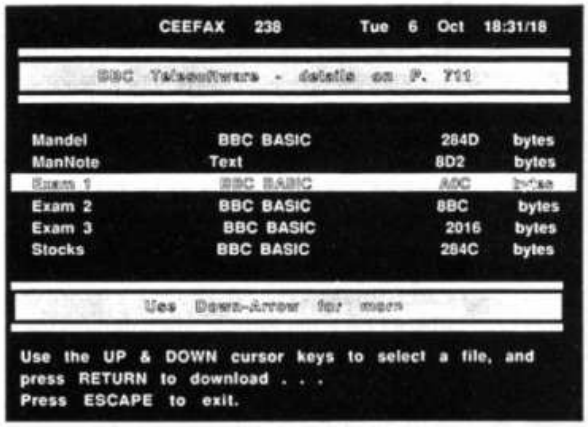
Telesoftware

Pressing function key five from the terminal takes you into the software downloader. It looks for the current catalogue of software available and displays it as a menu on screen. All you have to do to download is to highlight the required program. There are no facilities for batch downloading.

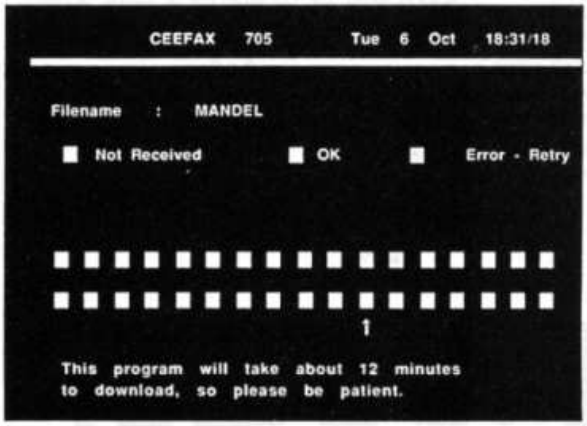
The equivalent star command is *DOWNLOAD. It is a potential disaster for DFS owners who may already have a *DOWNLOAD in their DFS utilities (Solidisk is one such DFS). Sensibly however GIS have included an optional T prefix to help make the ATS commands unique. A straightforward session downloading can start simply:

***TTXON**
***BBC2**
***TDOWNLOAD**

Terminal status.


CEEFAX 238 Tue 6 Oct 18:31/18
Mandel BBC BASIC 284D bytes
ManNote Text 8D2 bytes
Exam 2 BBC BASIC 88C bytes
Exam 3 BBC BASIC 2016 bytes
Stocks BBC BASIC 284C bytes
Use the UP & DOWN cursor keys to select a file, and press RETURN to download . . .
Press ESCAPE to exit.

File selection.


CEEFAX 705 Tue 6 Oct 18:31/18
Filename : MANDEL
Not Received
OK
Error - Retry
This program will take about 12 minutes to download, so please be patient.

File downloading.

Programming

Programming with the ATS ROM should present few problems. You might wish to automate an aspect of your use of the teletext services, to produce a special front-end or interface the service with, say, a local viewdata network. The manual gives full details and a short program example for each OSWORD call.

```
*commands

GIS ATS+ V1.00
*BBC <n>
*CH <n>
*DATA <addr>
*DATE
*DISPLAY <addr>
*DOWNLOAD
*HOFT
*HON <n>
*ITV <n>
*MAGAZINE <n>
*NOTTX
*PAGE <nnn((S)nnnn)>
*REVEAL <addr>
*S4C
*STATUS
*TELETEXT
*TELESOFT
*TIME
*TON
*TRANSFER <addr>
*TSDP
*TTXOFF
*TTXON
*TUNE
```

Conclusions

The new adaptor offers an excellent physical design, user-friendly terminal operations and telesoftware downloading and a good 120 page manual. I encountered two problems, the clash of * commands with other utilities. This can be solved by turning off a ROM but this is not convenient if it happens to be your DFS! Access to telesoftware downloading from the terminal may not work for this reason. Secondly when searching for a subpage, the process was so slow as to make it useless.

Teletext Services

Ceefax (BBC) and Oracle (ITV) are public viewdata services transmitted with your usual, and visible, televison signal. The "competition" are the comparable services delivered via the telephone. Ceefax and Oracle are inferior to Prestel as information services. It lacks detail in areas such as finance and travel and there is no interaction. Prestel has a vast array of independent paying information providers. Also on Prestel you can respond, write to the editor or book a ferry crossing. With Ceefax you are a passive user.

The Ceefax microcomputer area is sparse compared with, say, Micronet. The great advantage is that there are no fees for being online. Once you have the hardware and software, everything is free. Telesoftware is a potentially major attraction but the software available varies considerably in quality, although the service is very successful in providing a variety of programs. Software downloading is less painful than on Micronet, both in procedure and on the pocket!

It remains to be seen whether technical improvements to the service will allow for more software to be made available in this most convenient form. It is certainly under-utilised as a method of software distribution at the moment.

IMAGE

Image manipulation by simulating parallel processing on a BBC Model B, Master 128, Compact and Electron

Paul Kennedy

The processing of images by computer to enhance certain features has in recent years become almost commonplace, with everything from weather maps to spacecraft using the technique. In the field of robot vision, image processing plays a vital role in extracting the information from an image which allows a computer to build up a model of the world surrounding it.

Unfortunately most sophisticated methods of image processing have one thing in common, they require large amounts of processing power and/or computer time. This has led to the development of so called parallel processing computers which are uniquely suited to the job of image analysis. In these machines each pixel (picture element) of the image is connected to its own simple processor, which in turn is connected to the processors of other nearby pixels. The image processing then comes about by simple program steps in which the new state of each pixel is decided by its own current state, the current state of its neighbouring pixels and by the program itself running simultaneously in each of the processors.

These simple "nearest neighbour" operations can perform surprisingly sophisticated tasks. Anyone who has ever seen the program LIFE in which the computer mimics the evolution of a colony of bacteria according to simple nearest neighbour rules will appreciate this.

In parallel

The following assembly language program simulates the operation of a parallel processing computer on the Mode 4 display of a BBC Micro (ie 320x256 processing elements!). The routine is first assembled and then the required picture is drawn or loaded to the screenfrom tape or disc (eg *LOAD picname 5800). The routine is then run from the program with the command:

CALL image,O%

where O% is the variable which dictates the operation to be performed (the "operator"). The exact form of this number and how it controls the function of the program can be appreciated by considering a single screen pixel, eg:

```
-------
8 1 2
-------
7 * 3
-------
6 5 4
-------
```

Every pixel on the screen, such as the one shown as "*" above, is surrounded by eight neighbours, each of which can be either white (logic 1) or black (logic 0). Thus by counting the values of the pixels surrounding the one shown as "*" we get a number from 0 to 8 inclusive (ie nine possible values). Also, if we are to act on the specified pixel we can only perform one of four distinct operations on it, these are shown in Table 1 below.

Operation Number	Operation
0 = 00 binary	No operation, pixel is left unchanged
1 = 01 binary	Invert the current state of the pixel
2 = 10 binary	Force pixel into a logic 1 state (white)
3 = 11 binary	Force pixel into a logic 0 state (black)

Table 1 List of possible operations on a single pixel.

The operator passed to the machine code routine is an 18-bit binary number regarded as a table of nine 2-bit binary numbers. For each pixel on the screen the number of its neighbouring pixels which are in a logic 1 state is counted. This provides a pointer to two of the bits of the operator which in turn define the action to be performed on that pixel via the list shown in Table 1. Thus the operator:

(Pixel count = 8 7 6 5 4 3 2 1 0)
Operator value = 11 00 00 00 00 00 00 00 00 binary (or 196608 in decimal)

would force all pixels that are totally surounded by white neighbours to become black, all others being left unchanged. This has the effect of leaving just the edges of a white image intact, whilst setting internal points to black (BBC owners now have the opposite of a FILL or PAINT command, perhaps it should be called a SCRAPE function??). Similarly calling the routine with:

O% = 00 00 00 00 00 11 11 11 11 binary (or 255 in decimal)

would leave alone white points with four or more white neighbours, setting all other points to black. This has a very useful application in removing noise from an image as this usually consists of small isolated points of a different colour to their surroundings (eg lowpass filtering of image).

Addictive

The routine itself takes about 13 seconds to complete one pass of the screen and can become quite addictive to watch as it passes from top to bottom. Also to prevent problems concerned with points on the edge of the screen the routine automatically "wraps around", that is the points to the left of the left hand edge of the screen are taken to be the points on the right hand edge and vice versa (similarly for the top and bottom of the screen).

Aside from providing an insight into how simple actions can perform sophisticted tasks when performed in parallel the program can also be used just for fun. By a suitable choice of the operator and of the image some incredibly intricate patterns can evolve. Text such as the program listing itself can be made to grow in much the same way as frost on glass, or a single point can be made to grow into a large crystaline design. The best policy is to experiment, after all there are only 2 ↑ 18 or over 250,000 possible operators to choose from!

Paul Kennedy has just completed a university degree in optical character recognition

```
 10 CLEAR : MODE 4
 20 DIM prog% 540,line0% 40,line1% 40,line2% 40,line3% 40,line4% 40
 30 tab%=&C375 : FOR pass%=0 TO 2 STEP 2 : P%=&70 : [ OPT pass%
 40 .himem EQUB &58 : .lncnt BRK : .bycnt BRK : .btcnt BRK
 50 .topln EQUW line0% : .oldln EQUW line1% : .nowln EQUW line2%
 60 .nxtln EQUW line3% : .newln EQUW line4% : .oprtr EQUW &0000
 70 .vctr1 EQUW &0000 : .vctr2 EQUW &0000 : .vctr3 EQUW &0000
 80 .bmask BRK : .cmask BRK
 90 .temp1 BRK : .temp2 BRK : .temp3 BRK
100 ] : P%=prog% : [ OPT pass%
110 .exit BRK : BRK : EQUS "Fault" : BRK \...very silly error message!
120 .image LDA &355 : CMP #04 : BNE exit \...are we in MODE 4 ?
130        LDA &600 : CMP #01 : BNE exit \...right number of arguments ?
140        LDA &602 : CMP #04 : BNE exit \...argument an integer ?
150        LDA &601 : STA oprtr          \...set up zero page pointer to
160        LDA &602 : STA oprtr+1        \...operator in location "oprtr"
170        LDY #255 : STY lncnt          \...point to bottom screen line
180        JSR lcalc : LDX #00           \...get its start address
190        LDA nowln : STA vctr2         \...now point to table "nowln"
200        LDA nowln+1 : STA vctr2+1     \...which hold current screen line
210        JSR lnswp                     \...store line from screen
220        INC lncnt : JSR lcalc         \...now get address of top (0) lin
230        LDA topln : STA vctr2         \...now point to table "topln"
240        LDA topln+1 : STA vctr2+1     \...to hold original top line
250        JSR lnswp                     \...store line from screen
260        LDA nxtln : STA vctr2         \...also put top line into
270        LDA nxtln+1 : STA vctr2+1     \...table "nxtln"
280        JSR lnswp                     \...actually get it from screen
290 .lp1   JSR tbswp                     \...cycle the 3 tables down one
300        INC lncnt : BEQ finsh         \...next line, have we finished
310 .go    JSR lcalc : LDX #00           \...if not get next screen line
320        LDA nxtln : STA vctr2
330        LDA nxtln+1 : STA vctr2+1
340        JSR lnswp                     \...and put it into table "nxtln"
350        JSR nghbr                     \...operate on the line
360        DEC lncnt : JSR lcalc         \...find current line address
370        INC lncnt : LDX #128          \...ready to store back to screen
380        LDA newln : STA vctr2         \...point to table "newln" which
390        LDA newln+1 : STA vctr2+1     \...stores result of operation
400        JSR lnswp                     \...and put it onto the screen
410        JMP lp1                       \...repeat for all screen lines
420 .finsh LDY #39                       \...still have bottom line to do
430 .endlp LDA (topln),Y : STA (nxtln),Y \...get original top line and put
440        DEY : BPL endlp               \...into "nxtln" to give wrsparoun
450        JSR nghbr                     \...and operate on the line
460        DEC lncnt : JSR lcalc         \...find address of bottom line
470        LDX #128                      \...ready to store back to screen
480        LDA newln : STA vctr2         \...point to table "newln" which
490        LDA newln+1 : STA vctr2+1     \...stores result of operation
500        JSR lnswp : RTS               \...last line done, now end
510
520 .nghbr LDA #39 : STA bycnt           \...bytes per line minus one
530 .dobyt LDY bycnt : JSR gtbyt : LDA #00 \...do for LSB
540        LSR temp1 : ADC #00
550        LSR temp1 : ADC #00
560        LSR temp2 : LSR temp2 : ADC #00
570        LSR temp3 : ADC #00
580        LSR temp3 : ADC #00 : STA btcnt
590        INY : CPY #40 : BCC ok0 : LDY #00
600 .ok0   JSR gtbyt : LDA btcnt
610        ASL temp1 : ADC #00
620        ASL temp2 : ADC #00
630        ASL temp3 : ADC #00
640        STA btcnt : JSR mkmsk
650        LDA #02                       \...now do for middle six bits of byte
660 .bitlp TAX : LDY bycnt
670        JSR gtbyt : TXA : LSR A
680 .sftlp LSR temp1 : ROR btcnt
690        LSR temp2 : ROR btcnt
700        LSR temp3 : ROR btcnt
710        LSR A : BCC sftlp : LDA #00
720        ASL btcnt : ADC #00
730        ASL btcnt : ADC #00
740        ASL btcnt : ADC #00
750        LSR temp1 : ADC #00
760        LSR temp1 : ADC #00
770        LSR temp2 : LSR temp2 : ADC #00
780        LSR temp3 : ADC #00
790        LSR temp3 : ADC #00
800        STA btcnt : JSR mkmsk
810        TXA : ASL A : BPL bitlp
820        LDY bycnt : JSR gtbyt : LDA #00 \...finally do for MSB of byte
830        ASL temp1 : ADC #00
840        ASL temp1 : ADC #00
850        ASL temp2 : ASL temp2 : ADC #00
860        ASL temp3 : ADC #00
870        ASL temp3 : ADC #00 : STA btcnt
880        DEY : BPL ok7 : LDY #39
890 .ok7   JSR gtbyt : LDA btcnt
900        LSR temp1 : ADC #00
910        LSR temp2 : ADC #00
920        LSR temp3 : ADC #00
930        STA btcnt : JSR mkmsk \...byte wide operator masks now complete
940        LDY bycnt : LDA (nowln),Y     \...get the current byte
950        ORA bmask : EOR cmask : STA (newln),Y \...do the operation
960        DEC bycnt : BMI donln : JMP dobyt \...repeat for all bytes in li
970 .donln RTS \...new line is now in "newln" table
980
990 \...calculates start of "lncnt" line and stores it in "vctr1"
1000 .lcalc LDA lncnt : LSR A : LSR A : AND #&3E : TAX
1010        LDA tab%,X : STA vctr1+1 : INY : LDA tab%,Y : STA vctr1
1020        LSR vctr1+1 : ROR vctr1
1030        LDA lncnt : AND #7 : ADC vctr1 : STA vctr1
1040        LDA himem : ADC vctr1+1 : STA vctr1+1 : RTS
1050
1060 \...swaps screen line with start address in "vctr1" with 40 bytes
1070 \...of memory from address in "vctr2". X registers MSB used as a flag.
1080 \...if 1 = put to screen , else IF 0 = get from screen
1090 .lnswp LDY #39 : STY bycnt
1100 .lnlp  LDY bycnt : STY vctr3
1110        LDY #00 : STY vctr3+1
1120        ASL vctr3 : ROL vctr3+1
1130        ASL vctr3 : ROL vctr3+1
1140        ASL vctr3 : ROL vctr3+1
1150        CLC : LDA vctr1 : ADC vctr3 : STA vctr3
1160        LDA vctr1+1 : ADC vctr3+1 : STA vctr3+1
1170        TXA : AND #128 : BNE put
1180 .get   LDA (vctr3),Y : LDY bycnt : STA (vctr2),Y : JMP next
1190 .put   LDY bycnt : LDA (vctr2),Y : LDY #00 : STA (vctr3),Y
1200 .next  DEC bycnt : BPL lnlp : RTS
1210
1220 \...cycles down the tables of lines
1230 .tbswp LDY #39
1240 .swplp LDA (nowln),Y : STA(oldln),Y
1250        LDA (nxtln),Y : STA(nowln),Y
1260        DEY : BPL swplp : RTS
1270
1280 \...generates one bit of "cmask" & "bmask" depending on
1290 \...value of operator and "btcnt"
1300 .mkmsk LSR A : LSR A : TAY
1310        LDA (oprtr),Y : STA temp1
1320        LDA btcnt : AND #03 : BEQ skip : TAY
1330 .msklp LSR temp1 : LSR temp1 : DEY : BNE msklp
1340 .skip  LSR temp1 : ROR cmask : LSR temp1 : ROR bmask
1350        RTS
1360
1370 \...fetches three relevent bytes from tables
1380 .gtbyt LDA (oldln),Y : STA temp1
1390        LDA (nowln),Y : STA temp2
1400        LDA (nxtln),Y : STA temp3
1410        RTS
1420
1430 ] : NEXT pass%
1440 O%=196608 : REM...edge finding operator (=1100000000000000 binary)
1450 REPEAT : CLS
1460 MOVE RND(1280),RND(1020) : MOVE RND(1280),RND(1020)
1470 FOR I%=1 TO 6 : MOVE RND(1280),RND(1020)
1480 PLOT 85,RND(1280),RND(1020) : NEXT I%
1490 CALL image,O% : UNTIL FALSE
```

NEXT MONTH

NOVEMBER ISSUE OUT ON OCTOBER 7TH

WITH FREE FLEXIDISC ON COMPUTER MUSIC WITH THE BBC MICRO

In November we bring you a FREE flexidisc with a step by step guide to producing music with your BBC Micro.

WIN AN ARCHIMEDES 310 and MIDI MUSIC PODULE and the best in home music-making equipment from the major manufacturers in our incredible competition worth over £2,000!

PLUS
Communications – Gnome at Home and a hard investigation of soft porn – online!
A handy "front-end" from Beebug reviewed.
Plus the unique Arcade, comprehensive news (in colour) and fax pages to cut out and keep.

Archimedes

Reviews of the latest software.
EXLUSIVE music sequencer.
An "inbetweening" program for easy animation.
Defining pointers.
Beginning a series on BASIC 5 with lots of easy to type program examples.
Plus regulars like Programming the ARM and Forum.

SOFTWARE SALE

9 Hall Road, Maylands Wood Estate, Hemel Hempstead, Herts HP2 7BH 0442 41221

CHECK WITH THE TABLES TO SEE IF OUR SOFTWARE IS AVAILABLE FOR YOUR COMPUTER. PLEASE INDICATE YOUR REQUIRED PRODUCT NAME, NUMBER AND TRACK FORMAT IN THE ORDER FORM

INFORMATION

Software is only available on the formats recorded in the tables. It is not available on cassette tape. All prices include VAT and postage and packing. Please make cheques/postal orders payable to Argus Specialist Publications Ltd and print your name and address clearly on the back of your cheque. Telephone orders are taken for Visa and Access. All software is sent first class. Prices include postage and packing for European destinations. Please include £1.00 postage and packing (airmail) for other overseas orders. Please allow 28 days for delivery.

PRODUCT CODE NUMBERS

PROGRAM TITLE	BBC B/B+	MSTR 128	COMPACT	ELECTRON
Global View	DB01	DB16	DB33	DE06
Graphics Pack 1	DB03	DB17	DB37	DE01
Musician	DB06			
Mode 7 Utilities	DB12			
Adventurescape III	DB20	DB28	DB35	
Combat Zone	DB21	DB30	DB32	
Easy Font	DB26	DB39	DB44	
ADFS Menu		DB27	DB31	
Graphics pack 2	DB29	DB34	DB38	DE29
A&B Bibliography	DB40	DB53	DB54	
Statistics	DB41	DB42	DB43	
Games Compendium 1				DE45
Home Office	DB46			DE46
Graphics Constr. Set	DB49	DB50	DB51	
Compact 100			DB52	
Bibliography Upgrade	DB55			
Getting Into Assembler	DB61	DB62	DB63	
Wordwise Plus	DB64	DB65	DB66	
Sideways RAM	DB67	DB68	DB69	
Pascal	DB70	DB71	DB72	
Skywatcher	DB79	DB80	DB81	
Online!	DB82			
Disk User One	DU1			
Disk User Four	DU4	DU4		
Run The World	DB94	DB94	DB95	
Disk User Compact			DB96	
Screen Master		DB97	DB98	

AVAILABILITY AND PRICE

Name	Product	Price
Global View	DB01	£10.00
Electron +3	DE06	£12.00
ADFS	DB16	£10.00
Compact 3.5"	DB33	£12.00
Graphics Pack 1	DB03	£10.00
Electron +3	DE01	£12.00
ADFS	DB17	£10.00
Compact 3.5"	DB37	£12.00
Musician	DB06	£8.00
Mode 7 Utilities	DB12	£8.00
Adventurescape III	DB20	£15.00
ADFS	DB28	£15.00
Compact 3.5"	DB35	£17.00
Combat Zone	DB21	£8.00
Compact 3.5"	DB32	£10.00
ADFS	DB30	£8.00
Easy Font	DB26	£10.00
ADFS	DB39	£10.00
Compact 3.5"	DB44	£12.00
ADFS Menu	DB27	£12.00
Compact 3.5"	DB31	£16.00
Graphics pack 2	DB29	£10.00
ADFS	DB34	£10.00
Compact 3.5"	DB38	£12.00
Electron +3	DE29	£12.00
A&B Bibliography	DB40	£15.00
ADFS	DB53	£15.00
Compact 3.5"	DB54	£15.00
Statistics	DB41	£10.00
ADFS	DB42	£10.00
Compact 3.5"	DB43	£12.00
Games Compendium Electron +3	DE45	£12.00
Home Office	DB46	£10.00
Electron +3	DE46	£12.00
Graphics Construction Set	DB49	£10.00
ADFS	DB50	£10.00
Compact 3.5"	DB51	£12.00
Compact 100	DB52	£20.00
Bibliography Upgrade	DB55	£6.00
Getting Into Assembler	DB61	£10.00
ADFS	DB62	£10.00
Compact 3.5"	DB63	£12.00
Getting Into Wordwise Plus	DB64	£10.00
ADFS	DB65	£10.00
Compact 3.5"	DB66	£12.00
Getting Into Sideways RAM	DB67	£10.00
ADFS	DB68	£10.00
Compact 3.5"	DB69	£12.00
Getting Into Pascal	DB70	£10.00
ADFS	DB71	£10.00
Compact 3.5"	DB72	£12.00
Skywatcher	DB79	£8.00
ADFS	DB80	£8.00
Compact 3.5"	DB81	£10.00
Online!	DB82	£10.00
Disk User One	DU1	£4.00
Disk User Four	DU4	£4.00
Run The World	DB94	£8.00
Compact Version	DB95	£10.00
Disk User Compact	DB96	£15.00
Screen Master	DB97	£10.00
Compact Version	DB98	£12.00

Archimedes Software

Name	Product	Price
Adventurescape	DB86	£17.00
Global View	DB88	£12.00
Easyfont	DB90	£12.00
Graphics Construction Set	DB99	£12.00

Graphics Pack 2

Retouch of Class allows conversion of digitised or drawn pictures into letterhead format. **Sketcha** lets you design screens with simple commands. Option to incorporate screen into your own programs. **Islamic patterns** teach symmetry, geommetry. Screen dump provided. **Tangrams** – a fascinating oriental approach. Move the shapes into position, juggle colours and change angles.

A&B Graphics Pack 1

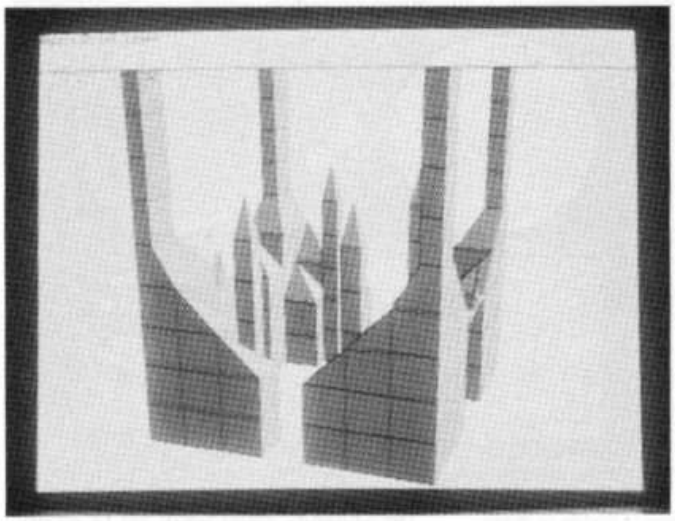
Ikon Full graphics facilities and icon editing. Keyboard or joystick. **Ikon Utilities** to convert Mode 4 pictures to Mode 1 and add colour and perform a slideshow. Many example screens included. **Touch of Class** A very classy printer graphics program (Epson FX80 compatible) for designing and dumping personalised letter heads. **Mosaic** Multicoloured building blocks for your own cartoon characters, landscapes and sprites. **Cadpack** Computer Aided Design. Sophisticated drawing, filing and retrieving facilities. A full library of drawing routines, scale, post and redraw.

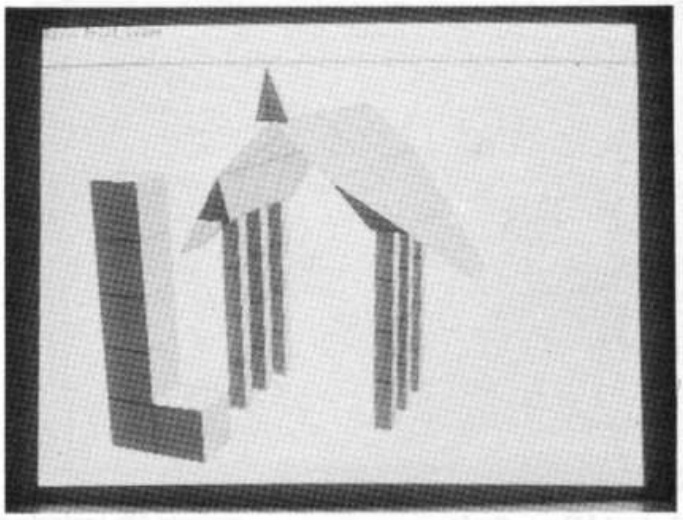
Easy Font

Attractive 'extra size' fonts: Old English, Cloister, Tea Chest, Folio, Futura, Old Towne, Japanette and Corvinus.

The fonts are controlled from BASIC. Example routines and instructions for use are given for each font.

SOFTWARE SALE





Graphics Construction Set

Quickstep provides routines for the rapid display of graphics in quick succession.

3D Construction Set is a suite of programs, *Design*, *Rotate* and *Perspective*, which allow three dimensional structures to be designed, edited and displayed on screen.

Bibliography

1983-87

- Model B, B+, Master 5.25" DFS £15.00 Order product number DB40 **1986-87 upgrade**
- Model B, B+, Master 5.25" DFS £6.00 Order product number DB55 **Full Bibliography now also on ADFS**
- Master 128 5.25" ADFS £15.00 Order product number DB53
- Compact 3.5" ADFS £15.00 Order product number DB54

Skywatcher

An essential program for the amateur astronomer or computer hobbyist looking for a new hobby. Skywatcher produces full data on where to look in the night sky.

Combat Zone

Play our combat simulations and then go on to write your own. The wargame generator allows the author to simulate any battle. For strategy fans, the disc also contains Battle of Hastings and the intergalactic struggle, Mabwars. Special versions included for shadow RAM machines.

Home Office

Easyword – fully fledged wordprocessor **Desk Diary** – full diary facilities with search dates, key string search, full diary description per entry and browse facility **Notepad** – quick 80 column memopad **Financial Manager** – bank and savings account processing **Mail List** – a database program tailored for mailshots **Forms printer** – a range of programs which produce invoice and delivery notes, statements, orders and credit notes.

Screenmaster

Video effects software

Professional video effects and advanced image processing. These machine code routines can be used to process any Mode 0, 1 or 4 graphics and are especially designed for use with digitised pictures.

The * commands are easily programmable for enhancing your own programs with "slides", "bangs", "fades" and many other screen effects. Screens can of course be recorded realtime onto video tape to create title pages, information screens and interesting links between footage. Pictures can also be prepared for desk top publishing packages.

Also included is a set software which works directly with the Watford BBC video digitiser, offering user-friendly capture and animation of digitised images.

All in all, this is the most comprehensive suite of software for manipulating digitised images on the BBC Micro.

ONLINE! – unique communications software for BBC Micro

Includes:

Beeb-Link – transfers any BBC Micro files from disc to disc over the telephone. **Beebterm** – scrolling text terminal with friendly features such as on screen costing of time online **Commscreen** – brilliant disc based manager for any viewdata (Mode 7) screens.

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All enquiries to Software Sale, Reader Services, 9 Hall Road, Maylands Wood Estate, Hemel Hempstead, Herts HP2 7BH Telephone 0442 41221

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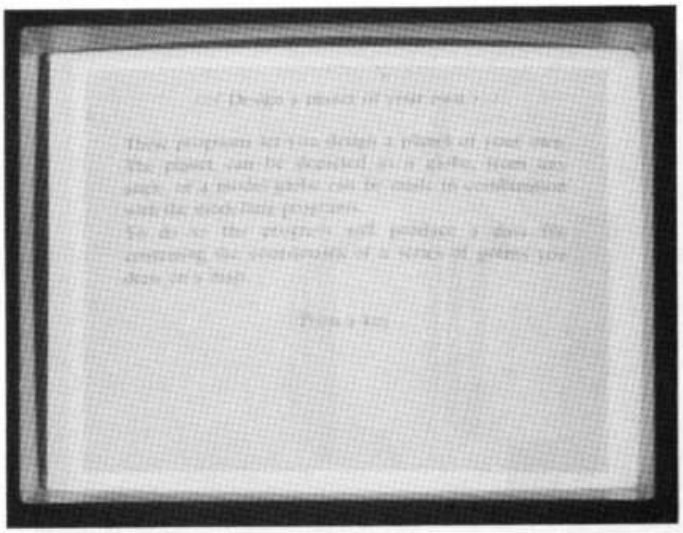
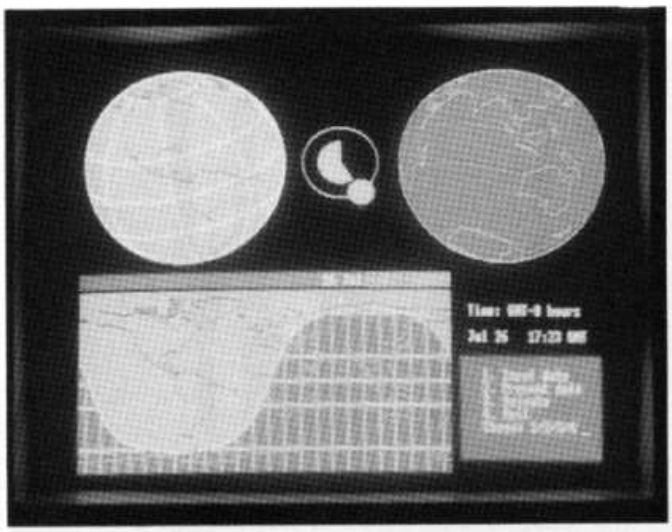
ADVENTURESCAPE – THE ADVENTURE WRITING SYSTEM

Adventurescape is supplied on two floppy discs.
Disk One: Adventurescape adventure generator locations descriptions puzzles dungeon adventure tutorial to be used in conjunction with the 20 page manual packaged with the software Murder at the Abbey, the classic whodunnit
Disc Two: Amnesia, massive adventure Xanadu, based on Coleridge's Kubla Kahn poem

The system consists of a 'shell' program which will run any one of a number of different adventure games, and two utility programs which provide friendly menu-driven editors to allow people to create the data files for a game of their own design.





Global View Suite

This Global View package incorporates full global graphical displays of the seasons, day and night; alternative maps; continental drift; equidistance maps; a module to design your own world; model globes – section printouts with which to make your own model globes, of the earth today, 1 million years ago, or a planet of your own making!

The adventure games which can be created include the following features:

(i) Up to 250 locations and 250 messages can be used. The descriptions may be lengthy and the total text far exceed the memory capacity of the computer, since these files are accessed directly from disc while the games are run.

(ii) Locations are connected by pointers allowing one way exits, twisty passages, mazes etc to be constructed.

(iii) Objects may be examined leading to messages which expand upon their usual description.

(iv) A very wide range of puzzles may be constructed using the unique puzzle generator of Adventurescape as will be explained in detail below.

What is more, this package includes no fewer than three sample games written with the system: Murder at the Abbey, Lost in Xanadu and Amnesia, in addition to the files of a short demo game 'Dungeon' whose construction is explained as a fully worked example in the manual.

A&B SOFT SALE ORDER FORM

PRODUCT NAME	PRODUCT NUMBER	DISC Please specify 40 or 80 track (ADFS equiv. Small & Large)	QUANTITY	PRICE
			TOTAL	

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I enclose a cheque/postal order made payable to **ASP** for £ .....

Please complete the form in block capitals and send it with your remittance to Software Sale, Reader Services, 9 Hall Road, Maylands Wood Estate, Hemel Hempstead, Herts HP2 7BH. Tel: 0442 41221.
You can direct technical enquiries about software to the suppliers on 0733 53355.

Disk User on Compact

640K of Disk User software on 3.5" disk for Compact owners.

Disk User leads the way, delivering 100K of useful and entertaining BBC Micro software on disk every month. Due to popular request we have transferred all the Master-compatible programs to 3.5" disk for Master Compact owners. Incredible value at £15.00 with full documentation – that's a 25 page manual – and easy to use menu structure.

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Distributors of: Electronic Components, Micro Computers & Peripherals

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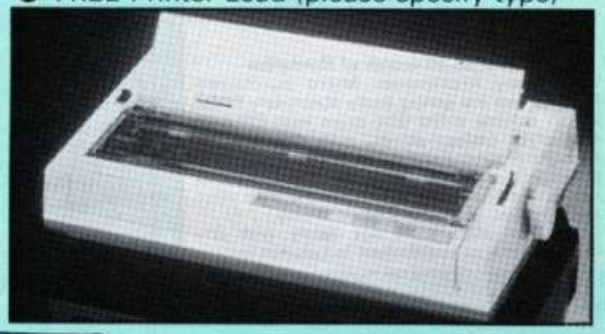

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305	£685	£735	£885
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(Securicor carr. £10 on Micros)

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Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Micro.

By Popular demand we are now supplying refurbished and fully guaranteed BBC Micro Model B with Disc Filing System

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Archimedes On-site Maintenance now available

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This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. This is a complete package, with its own power supply, ready to interface with your BBC Micro. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

New low price **£185**

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65C102 2nd PROCESSOR

(65C102 replaces the original Acorn 6502 2nd Processor)

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200%, depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B. This is a complete package, with its own power supply, ready to interface with your BBC Micro.

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With every Z88 purchased from us this month, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

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AA Nicad Rechargeable Battery	£1.50
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CO-PRO Adaptor

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.

Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.

With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.

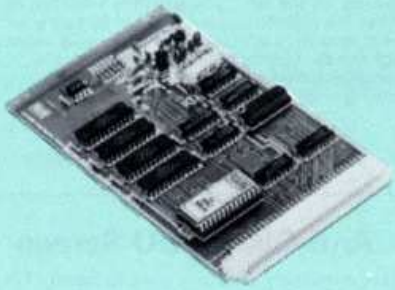
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.

Master owners may use Co-Pro to add a second Co-processor externally.

Watford, brings power to your BBC at only:

£35 (carr £5)

Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squahsed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

SPECIFICATION

SOFTWARE

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing – pressing a (configurable) key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers – pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, avaraging, subtracting, multiplication etc.
- Much faster versions of the Arthur *ScreenLoad and *ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

UTILITY DISK

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screendumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

RESOLUTION

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2,16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied).

Cont.

SPEED

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

HARDWARE

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

Price £249

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NEW

BBC PCB DESIGNER

At last! A PCB design package for the BBC Micro that eclipses some industry CAD software. Hard to believe, isn't it? Just look at some of the impressive package specification:

- Library Component Designer
- Component Library (over 200 parts)
- Component List Editor
- NetList Editor
- PCB Board Designer
- Plotter Driver
- Dot Matrix Printer Driver

This integrated suite of programs is packed full of sophisticated PCB related features making the design of a circuit board a dream instead of a nightmare.

Input for the design may be manual or Auto mode.

Some of the PCB Designer's features are:

- Over 120 library pad sizes/shapes
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- Highlighting of specific tracks
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- Rapid screen review
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- Pre-select pan/scroll facility
- Large 24" x 24" Board size
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- Ratsnesting of part connections
- Auto-plaement of text references
- Text linked to parts
- Automatic placement of vias
- Printer and plotter outputs provided
- Comprehensive manual

TYPES OF PLOT OUTPUT

Top and bottom track artworks, top and bottom silkscreens, solder resist mask, drilling detail drawing and check plot. All these may be with pad holes on/off, scale of 2:1 or 1:1, board edge on/off, 90 degres rotation, mirror image, width of pen, x & y offsets and batch plots to disc.

The above is only a taste of the superb features of this software, surely capturing previously unknown performance from the BBC Master computer. BBC B owners will need to fit at least one block of sideways RAM, Shadow screen memory and a disc drive. A trackerball or a mouse is also required.

Introductory Offer: £99

(Please write in for further technical details)

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BM7502 12" Hi-res Green Monitor	£65
CM8833 14" Med. Res Colour Monitor	£219
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CM8873 14" High Res Colour Monitor	£475

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- **PHILLIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

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SPECIAL OFFER
AMBER MONITOR

BT MERLIN/Acorn 12" Hi resolution Amber monitor. Ideal for wordprocessing. Consealed front panel mounted controls. Illuminated mains on/off rocker switch. Supplied complete with BBC Cable.

Only £49
(Offer valid while stocks last)

N.B. carriage on Monitors **£7** (securicor)

SPARE LEADS

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

By placing your monitor on one of our professional swivel bases (see monitors drawing on the left), you gain the freedom to adjust the monitor viewing angle to suit your needs and thus alleviate eye strain and reduce back stress. The front mounted adjustable control dial makes adjusting the monitor viewing angle very simple.

for 12" Monitors **£7** (carr. £2.50)
for 14" Monitors **£10** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks.

£12

TAXAN KP-815 PRINTER

80 column, Bi-directional, 160 CPS, (NLQ 24cps); Friction & tractor feed + paper roll holder as standard; Epson FX compatible.

Offer Price £155

Taxan KP915 132 Column Printerr (carr £7)	£275
RS232 Interface	£49
RS232 Interface with 2K Buffer	£69
RS232 Interface with 16K Buffer	£89

Panasonic KX-P1081

Attractively finished in BBC beige. Bi-directional, logic seeking. Has IBM and Epson RX compatible command calls. Speed: 120CPS draft mode, 24 CPS NLQ mode. Character width range from 5 cpi to 17 cpi. Upto 40 downloadable characters. Functions include, Proportional spacing, Justification, centering and left & right ranging.

(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£145** (carr. £6)
Optional RS232 Interface: **£39**

Panasonic KX-P3131 Daisy-Wheel Printer

Low-cost, high performance; Bi-directional, Logic seeking, Proportional spacing, 10, 12 & 15 CPI, Speed 17CPS. 6K Buffer.

Only **£255** (carr. £7)

Tractor Feed	£90
Daisy Wheel (various)	£12
Ribbons: Standard **£4.50**; Long Life **£7**	
Extra 32K Printer Buffer (internally fitted)	£10

Centronics LASER Printer

The first Sub £1000 Laser printer. Please write in for price and technical information. **£999**

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS – 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc.

Price: £269
FREE Price includes a Free BBC Cable.

Cut Sheet Feeder	£65
Additional Font Cartridge	£25
NEC P2200 Pinwriter Ribbon	£6

NEW

NEC PINWRITER P6/P7 Plus

The Ultimate matrix Printer for Business.

Some of the features are:
- Print Speed, 265cps in Draft and 90cps in letter quality.
- Inbuilt Tractor & Friction feed.
- A paper park & low tear of facility.
- 20 inbuilt FONTS as standard.
- A Font cartridge facility.
- 80K byte Printer Buffer as standard.

Added to all this is a 24 Pin printhead for high quality output, their Centronics parallel interface for easy connection to your computer. Both Pinwriters are software compatible with previous NEC 24 pin Printers, Epson LQ800/1000 & IBM XL24. Colour option is available (optional extra). All this at our launch offer prices of:

P6 Plus 80 columns	£415
P7 Plus 136 columns	£490
Cut Sheet Feeder	£125
Colour Option	£74
Serial Interface	£73

(For further details, write in for our technical leaflet).

EPSON PRINTERS

EX800	£415	LQ850	£469
EX1000	£569	LQ1050	£599
FX800	£315	LQ2500+	£825
FX1000	£425	LQ2550	£899
GQ3500 Laser	£1249	LX800	£199
LQ500	£285	SQ2500	£975
Star LC10	**£175**	**LC10 Colour**	**£219**

PLOTTERS

Hitachi 672 Colour Plotter	£475
Plotmate Plotter A4S	£379
Plotmate Plotter A3M	£549

CUT SHEET FEEDERS for

EX800 **£130**; EX1000/LQ2550 **£195**; FX800 **£135**; FX1000 **£169**; LQ/LX800 **£125**; LQ500 **£75**; LQ850 **£135**; LQ1050 **£175**.

TRACTOR FEED for

EX800/1000 **£78**; LQ800 **£44**; LQ850 **£69**; LQ1050 **£75**; LQ2500 **£195**

ACCESSORIES

EX800/1000 Colour Option	£55
EX800/1000 Colour Ribbon	£18
LQ2500 Colour Option	£65
Epson Paper Roll Holder	£19

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	£27	RS232 + 2K Buffer	£52
IEEE 488	£65	RS232 + 8K Buffer	£62

Universal Printer Sharers/Changers

Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments.)

Connects	Serial	Centronics
2 to 1	£22	£23
3 to 1	£30	£32
5 to 1	£40	£42

(Cables extra at £6 each. Please specify type required when ordering)

INTEGREX COLOUR JET PRINTER

- Colour Jet 132 Printer £515
- Paper Roll £6
- Screen Dump Software £10
- Colour Cartridge £14
- Black Cartridge £8
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £99

Professional Printer Stand

This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

80 Column version £23 (carr. £2.50)
132 Column version £26 (carr. £2.50)

PRINTER LEADS

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 1 meter	£7
IBM Parallel Lead 1 meter	£7
Double Ended 36 way Centronic Lead	£9
RS232 Leads (Various)	P.O.A.

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
IBM PCs pair	–	£9.95
Brother HR15/20	£3.00	£5.00
DMP2000	£4.00	£4.75
EX/LQ800	£5.00	£4.50
EX/LQ1000	£8.00	£5.00
RX/FX80/85/800/MX80	£4.00	£4.95
RX/FX100/1000	£6.00	–
Kaga/Taxan KP810/815	£5.25	£4.00
LC10 (Black)	£4.50	£5.00
LQ500/800	£4.00	£5.00
LQ1050/LQ2500	£9.00	£5.50
LX80/86/800	£4.00	£4.50
M1009/GLP	£4.00	£3.75
Panasonic KX1080/81	£4.50	£4.75
SQ2500	£25.00	£5.50
Star NL10	£4.00	£4.50
Olivetti Ink Jet Cartridges (set of 4)	£10	

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

- *1,000 Sheets 9½" × 11" Fanfold Paper* **£7**
- *2,000 Sheets 9½" × 11" Fanfold Paper* **£12**
- *1000 Sheets 9½" x 11" NCR 2 Part Fanfold* **£19**
- *1,000 Sheets 15" × 11" Fanfold Paper* **£9**
- *1000 Sheets true A4 Fanfold Paper* **£11**
- *2000 Sheets true A4 Fanfold Paper* **£19**
- *Teleprinter Roll (Econo paper)* **£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

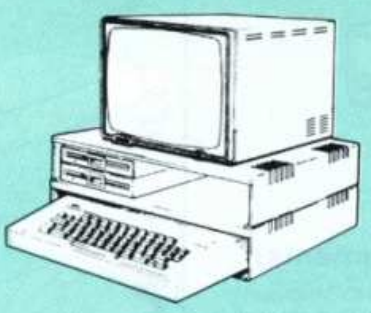
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	***£5.00***
1,000 90 × 36mm (Twin Row)	***£4.90***
1,000 90 × 49mm (Twin Row)	***£7.50***
1,000 102 × 36mm (Twin Row)	***£6.25***

Carriage on 1,000 Labels £1.00

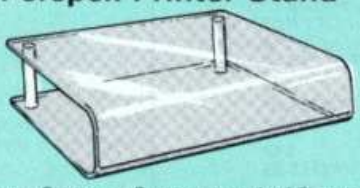
PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid. The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows access to paper from all sides.

Single BBC Plinth	**£12** (carr. £2)
Double BBc Plinth	**£20** (carr. £3)
Printer Plinth	**£12** (carr. £2)
Single Master Plinth	**£13** (carr £2)
Double Master Plinth	**£24** (carr £3)

Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

Only: £16 (carr. £3)

Copy Holder

Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£10** (carr. £2)
Angle poise **£14** (carr. £3)

MEGABUFFER 256

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

***Only £179** (carr £2)*

OKIMATE COLOUR PRINTER

The first ribbon transfer printer in its price range which offers fully versatile colour or black printing. A 24 element print head produces more than 100 shades with exceptional clarity. Ideal for use with Quest Paint or AMX Super Art.

Only: **£119**

BBC Screen Dump	£10
Colour Ribbon	£6
Black Ribbon	£6

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

. It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

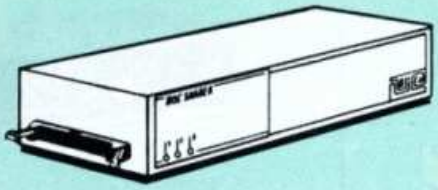
£5.95 (No VAT)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Continued

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: **£65** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for six years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn standard DFS). (while Acorn's 1770 DFS is fully compatible with Watford's Mk II DDFS)***

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£48**
- *Acorn's 0.90 DFS Kit complete* **£49**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**

(P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).

- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** • *ADFS ROM only* **£25**

NEW

Watford's MkII 1770 Double Density DFS Interface

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80°₀ storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00**.

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

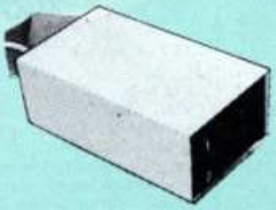
DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Special 40/80 Disc Drive/DDFS Mk II Offer

- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both, Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£125** (£6 carr)
(Offer valid while stocks last)



3½" DISC DRIVE OFFER

These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- **CLS35 400K Unit** **£69**
- **CLD35 800K Unit** **£126**

Mysteries of Disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in black leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

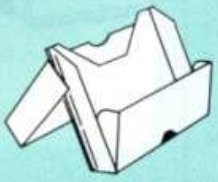
£6

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** - holds upto 50 5¼" discs **£6.00**
- **M85** – holds upto 95 5¼" discs **£8.00**
- **M25*** – holds upto 25 3½" Discs **£5.50**
- **M50** – holds 50 3½" Discs **£7.50**
- **M10** – holds upto 10 Data Cartridges **£15**

* Not lockable



PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. *Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

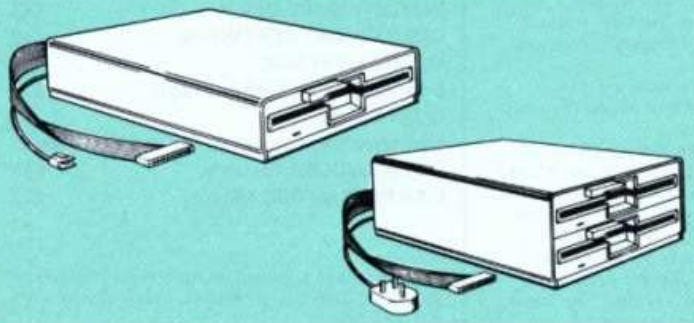
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. *(Turn to the 5th page of our advert for the Plinths).*
P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £82	CLD 400 £168	CS 400S £92	CD400 £188
800K (1.44M)		CLD 800S £162		CD 800S £182

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £5 to £6

Prefix ***C*** *= Cased Drive*
L *= Less PSU*
S *= Single*
D *= Double*

Suffix ***S*** *= 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

- *10 × 5¼" S/S D/D 40 Track Diskettes (744)* ***£6.00***
- *10 × 5¼" D/S D/D 40 Track Diskettes (745)* ***£7.50***
- *10 × 5¼" S/S D/D 80 Track Diskettes (746)* ***£11.50***
- *10 × 5¼" D/S D/D 80 Track Diskettes (747)* ***£11.75***
- *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT* ***£19***
- *10 × 3½" S/S D/D 40/80 track Discs* ***£10.00***
- *10 × 3½" D/S D/D 40/80 track Discs* ***£11.75***
- *10 × 3½" High Density Diskettes* ***£37***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

- *10 × **M3** 3½" D/S D/D 80 Track Discs* ***£11***
- *10 × **M9** 3½" D/S D/D 80 Track Discs* ***£3[1]***
- *10 × **M4** 5¼" S/S D/D 40 Track Discs* ***£5***
- *10 × **M5** 5¼" D/S D/D 40 Track Discs* ***£7***
- *10 × **M7** 5¼" D/S D/D 80 Track Discs* ***£9***
- **10 × M8 5¼" D/S H/D Hi-Density Discs** **£14**
- *3" Double Sided Discs* ***£3 each***

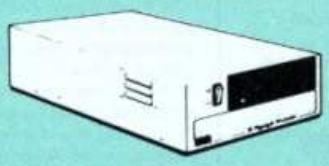
PRICES SLASHED

Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48



WATFORD's WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a full user guide and full utilities including file copy, 1000K save routines, Format and Verify – in fact all you need and more.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBc B (with 17 X disc interface).

● 10 Megabyte **£350;** ● 30 Megabyte **£420**

CDP800S **CDPM800S**

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £192
CDPM 800S for Master £196
DP35-800 for BBC/Master £165
(For DP35-800S spec. see Page 9 of our advert)

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued

NOMINATED FOR BRITISH MICRO COMPUTING AWARDS 1987

QUEST MOUSE

QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface. This also eliminates any directional bias that one encounters on the most well-known mouse for the BBC. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package

With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87
"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."
"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87
"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87
". . . Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."

". . . you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."

"What we have here is probably the best art package there is for the BBC Micro . . ."
"Quest Paint is a major leap forward in BBC programming. . ."
"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87
"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."
". . . this package represents excellent value for money. If you are interested in art then this program is for you to buy".
"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".
"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".
"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".
"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".
"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."
"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".
"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program".
The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:
"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Col. C.G. Holton, HQ 1 (BR) Corps, BFPO 39, writes:
"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:
"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.
Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

QUEST MOUSE & QUEST PAINT	**£54**
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	**£82**
QUEST MOUSE ONLY	**£25**
QUEST PAINT SOFTWARE	**£32**
QUEST FONT DISC	**£12**
ConQuest 32K ROM Package	**£29**
QUEST MAT	**£3**
Part-exchange your old Mouse for a New QUEST MOUSE for only	**£23**
GXR ROM for BBC Micro	**£22**

N.B.
1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21
(Price includes FREE software Disc and Operating Manual)

RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)	£52
RB2 including Quest Paint	£78

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Software Pack for Compact	£40
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

THE NEW Mk III AMX MOUSE

ONLY: £59 Inc. Super Art package
(carr £1.50)
(Please specify for BBC, Master or Compact)

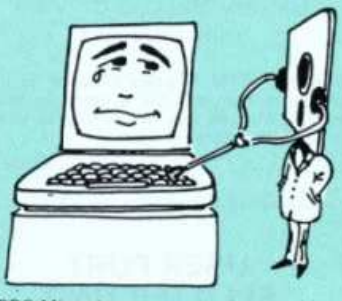
FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX UTILITY Package	£11
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£12
AMX DESIGN (ROM)	£55
AMX 3D ZICON Disc	£19
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£15

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BEEB VIDEO DIGITISER

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package i designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)
A combination of the Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE

- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

Disc Drives DP35-800S

A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. For ease of access, the switches are front mounted. DP35-800S has its own power supply, independent of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

Launch Offer: **£165** (carr. £7)

Continued

ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

● Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price:	Aries B-12	**£40**
	Aries B-12C	**£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

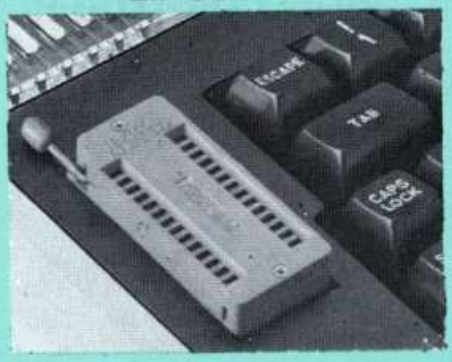
£238 (Carr £3)

EXTERNAL ROM BOARD for BBC MASTER

This external Beige finished, free standing cased unit with its own Power Supply allows you to plug-in upto 12 ROMs and 16K Sideways RAM.

Only £78

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

● Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.

● The low profile of the socket allows unrestricted access to the Keyboard.

● All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

● This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

● BBC, B+ and Master compatible.

ONLY **£16** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

ROM Cartridges for the BBC Master
Twin **£8**; Quad **£12**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

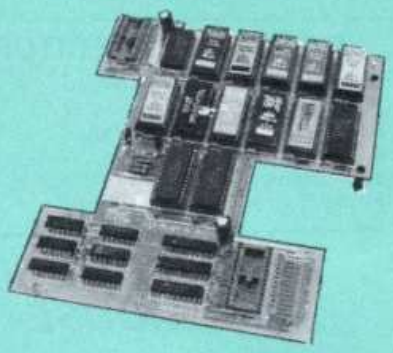
- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

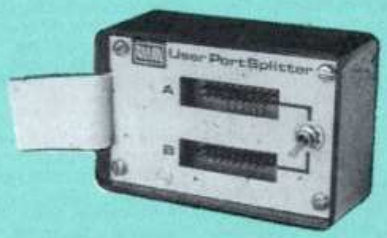
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish"! allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
Battery Backup only **£3**
(carriage £2)

● Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

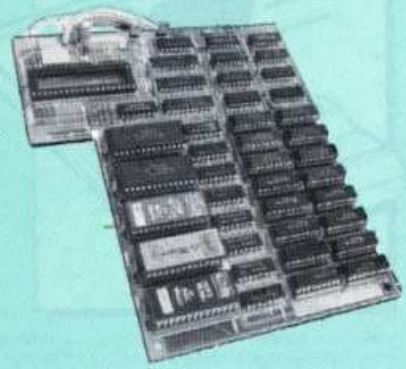
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM ***£45***
- ROM/RAM card with 64k dynamic RAM ***£59***
- ROM/RAM card with a massive 128k dynamic RAM **£89**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit **£16**
- 16k Dynamic RAM for Upgrade **£16**
- Battery backup **£3**
- Read and Write protect switches ..... **£2** each

Complete ROM-RAM board
All options installed **£115**

P.S.
Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***

SPECIAL OFFER

Price: ***£82***
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£15 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

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Price includes, the Modem, Comm Software Cables & Operating Manual).
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For the BBC Micro. Attractively finished in antique brown leatherette. Lockable.

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The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

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Continued →

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Wordwise £23

Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
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- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

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ROM Version	£43.00

(When ordering please specify for which Micro & 40 or 80 track Disc).

EPSON NLQ ROM

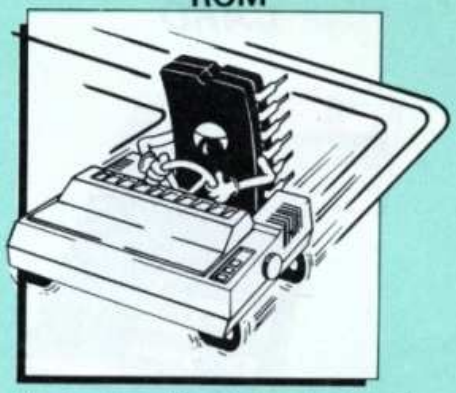
Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM £7

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

ROM-SPELL

Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics. Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

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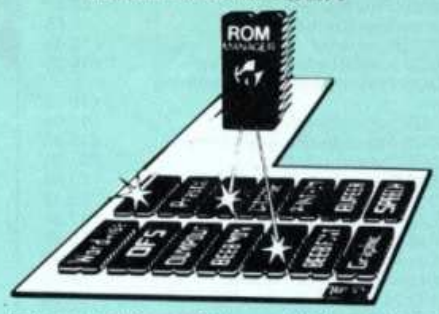
ROM MANAGER



Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.
"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

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ADDER

The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.
Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.
Features

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£75 (£3 Carr)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
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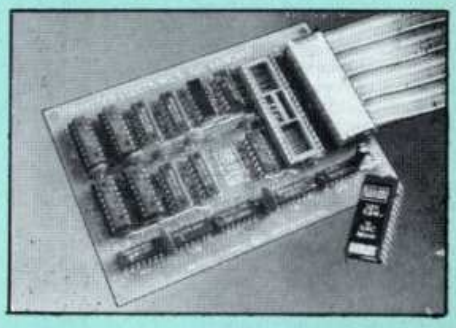
- Spare UV tubes. **£9**

32K

SHADOW RAM- Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

Continued

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"Why has no-one written a book like this before? It's long overdue".

If you own a BBC-B, BBC B+, Electron, Master 128, Master Compact or Archimedes then this book is for you. It shows you how to get the most from your computer, and how to make the computer work for you. Although some sections are machine specific, most of the information, programs, hints and good solid experience are for the whole range of BBC machines. The general style and level means that both beginner and expert will feel satisfied with the quality and quantity of the material.

GENERAL – Uses and abuses of computers.

HARDWARE – How to design your own work station. Hardware additions (disc drives, ROMs, printers, 2nd processors, etc). DIY alterations.

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Only: **£14.95**

NEW

The Advanced Reference Manual for the BBC Master

At last Acorn's long awaited Advance Reference Manual for the BBC Master Series of Microcomputers has now been published. Watford Electronics' own authors have edited and added missing sections to the original script and produced a very high quality publication.

It features information about:

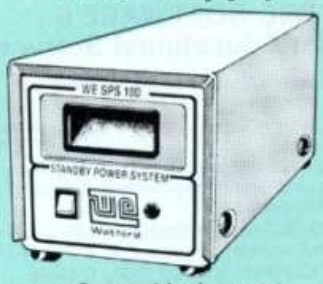
- Memory Organisation
- Slow data bus
- Detailed circuit description
- Keyboard controller
- Screen display
- User port
- Serial Processor
- Peripheral bus controller
- 1 Mhz Bus
- Machine operating System
- Second processors – Internal, Z80 and 80186
- Disc Filing Systems
- ANFS
- Terminal Emulator & Editor
- View internal format
- Detailed differences between Model B, B+, Master 128K and Compact
- Comprehensive appendix on 65C12 instruction set

At the rear of the manual there are pull out circuit diagrams for the Master 128K. A worth-while addition to any Master owner's library.

All this for just £19 (NO VAT)

NEW

Standby Power Supply



Our compact & portable, low-cost Standby Power Supply Unit is attractively finished in light Grey. In the event of low voltage condition or a power cut, it supplies power to your micro or other electronic equipment like telephone, telex system, Paging & communication systems, any sensitive microprocessor based electronic equipment for 10 to 15 minutes.

Some of its features are:
Can be easily installed; has automatic operation; internal batteries are automatically charged; On/Off illuminated front panel mounted switch; overload & short circuit protection; mains failure audible alarm; logic signal status monitoring.

- I/P V: 240V; 50Hz; Single Phase
- O/P load: 250VA
- O/P Volt: 240V 50Hz
- O/P Waveform: Sine wave < 7% THD
- Typical Backup time 10-15 minutes
- Transfer time: 2-10 mSec. Typ 4mSec
- Transfer point: Powerline to Inverter 204VAC; Inv. to Pline: 221VAC

Batteries:

- Batteries: 4 lead acid maintenance free sealed for life
- Battery Protection: Auto low Volt shutdown
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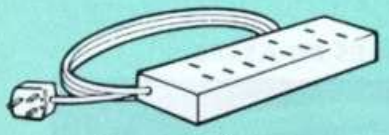

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GRAPHICS PACKAGE

Imagine Quest Paint re-written to take advantage of the high resolution of Mode 0, well this is it. The Wapping Editor could well be worth buying for this section alone. This must surely be the graphics.

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Continued ——→

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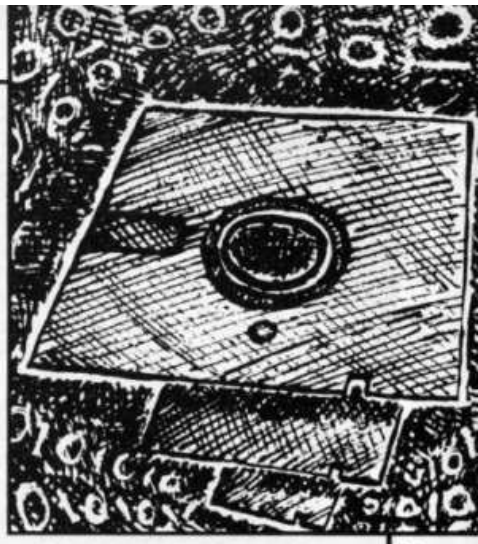


ADVENTURING

Jonathan Evans

Looking at the latest games from Alpine Software and Heyley Software. First, however, I have a couple of authoring systems to discuss.

An authoring system is a programming language or environment which is specialised for the writing of adventure games, and which preferably opens this up to authors who would have been defeated by the technicalities of programming in BASIC or assembler. I have discussed several such systems in earlier articles and the best so far have been Gilsoft's *The Quill* and Incentives *Graphic Adventure Creator (GAC)*. Both these systems allow relatively easy design and test of games with a wide range of puzzle types, though the size of the games created is limited by the memory of the computer. My own system, *Adventurescape*, (which is still on sale through A&B), is slightly less flexible but easy to use and permits the writing of much larger games as it uses disc files. The Heyley games, to be discussed later, are actually based on a modified version of Adventurescape III.

PenDown Adventure Writer

Logotron aim their products principally at the education market, and I have discussed their implementation of the Logo languages in several recent articles. Their word processor, *PenDown*, is designed for ease of use by children rather than practical business use which explains the unusual 40 column WYSIWYG on a Mode 7 screen. An associated a product which has been on the market for some considerable time also is the *PenDown Adventure Writer* which I thought I should take a look at sometime, if only for the sake of completeness.

Although the games produced by this system can be run stand-alone (ie in the absence of the PenDown ROM) I have to say straight away that the system is not suitable for serious adventure game writing. The way it works is that you write a series of PenDown text files which contain two segments. First there is text which will be presented on screen (eg as a location description). This can be as long as you like and will be viewed by the user pressing cursor keys if it exceeds a screen. The end of the text is marked by typing in ENDTEXT and can be followed by a "program". The program contains what game logic the system has, but is severely limited. The lines consist of IF..THEN statements but permit only three types of condition and three types of action. Examples are:

```
IF SAY "OPEN DOOR" AND CARRY "KEY" THEN BRANCH "HALLWAY"
IF SAY "OPEN DOOR" AND NOT CARRY KEY THEN PRINT "What with?"
IF SCORE < 100 THEN PRINT "You are not yet worthy to hear my riddle. Go and collect more treasure"
```

The three conditions are based on what is typed by the player, what is, or is not carried and what score the player has. The actions are to print messages on the screen, change the score or to move to another location (file) by the BRANCH command. In development each location must have a different file which is a limitation in itself since PenDown does not work with the ADFS (at least the version I was sent did not). However, the files are may be spread over several disc surfaces and are collected together into one file when the adventure is assembled.

The attachment of programs to locations is most unorthodox and means for example, that the system will understand words in some locations and not others. Objects may be left (initially) in a location by putting the command OBJECTS: <object list> at the top of the program. The system provides standard commands for listing what is held and present, taking and dropping objects etc. However, there is no way for the user's program to know whether an object is present in the current location but not being held. More seriously, the absence of any system of flags make the construction of any complex puzzle logic virtually impossible.

PenDown Adventure Writer should be taken as it as intended as an extension of the PenDown educational project in which children are encouraged to undertake creative writing and achieve a simple interactive game structure. It is not a competitor with the systems mentioned above for the authoring of serious games. The ALPS system considered below, however, certainly is intended to compete in this market.

ALPS

ALPS from Alpine (formerly Summit) Software is an acronym for Adventure Language Programming System. As we shall see, it falls at the opposite end of the ease of use/power trade-off to the PenDown system, being extremely powerful and flexible, but hardly suitable for use by non-programmers. The standard package consists of a ROM, disc and manual. Games are written in an environment created by the ROM and may be run and tested without leaving this environment. However, routines on an extensions disc permit finished games to be produced in stand-alone form for distribution to standard machines (BBC and Master series). Whilst the standard games are in-memory only, optional extensions discs also include a facility for writing large games which access the disc. The company have themselves written one such major disc based game called *Plague Planet* (available separately) which is reviewed below.

There are too many keywords in the ALPS system for me to list them all, but I have tried to convey the main functional properties in Table 1. On entering the language with *ALPS, you can use any of the main commands shown in Table 1.1. A game can be loaded for editing or created from scratch and all associated program and data will be held in memory unless deleted by NEW. The system includes four editors which deal respectively with objects, rooms, messages and the "program" or game logic. The object editor is entered by pressing <f4>. This allows you to define for each of a set of objects its starting room and state and the message number used to describe it to the player. In ALPS all text, for object and room descriptions as well as general messages is held in one message list. Objects and rooms can have a "state" represented as a number between 0 and 255, to represent for example, a creature being alive, dead or wounded or an object in various states or repair. As if that wasn't enough there are also several binary flags associated with each object (and room). One of these, for objects, is a standard flag set to indicate that it is a light source. If these do not suffice, the programmer also has access to 50 plus general integer variables for manipulation!

As suggested above the room editor is similar to the object editor in that states, flags and message numbers (for descriptions) are provided for each. In addition pointers to rooms from exits are provided (restricted, surprisingly, to north, east, west, south, up and down). You may also specify the number of an "exit routine" associated with each exit, so that movement may be made

conditional upon actions having been performed (eg opening a door). The text editor allows you to edit the contents of each numbered message one at a time in reasonably friendly fashion. An ingenious feature here is ability to define message "switches" which permit the message printed to be dependent upon the state or an object (room) or associated flag. This solves the problem of how to describe something differently when its logical state has changed (eg it is broken).

The game logic is contained in a program written in the many ALPS keywords provided and described in outline in Table 1. One of the major features of an ALPS program is the use of subprograms which define the meaning of the verb typed in. Such definitions may contain a variety of conditional statements and actions and calls to general procedure definitions. The appropriate verb definition is invoked when the command PERFORM is issued in the main program at the top. Unfortunately, the system provides only a crude line editor for writing programs where a full screen editor would be highly superior. In recognition of this problem, the company suggests that a word processor could be used to prepare program text. However, to do this you must exit ALPS, write the text, create a spooled file and then EXEC the instructions into the program editor on re-entering ALPS. This is far from ideal since one loses the ability to test and debug the program through rapid interaction with the system.

The standard package is well thought out and good value for money. However, the functionality of the system can be significantly enhanced by the purchase of two further discs. The ALPS Extras Pack includes automatic text compression (achievable only be tedious programming in the standard version), a number of prewritten program procedures including an advanced parser and a facility for providing coloured text. The

In general, my verdict on the ALPS system is highly favourable. It is undoubtedly the most powerful and flexible of all the adventure authoring systems for the BBC micro that I have seen, including Graphic Adventure Creator, The Quill and our own Adventurescape system. It is the only one, apart from Adventurescape, that also permits use of the disc for writing large games. My reservations lie in the area of the program editor, partly because of the lack of full screen editing which would be ideally desirable and mostly because of the complexity of use. I would definitely not recommend ALPS for use by someone inexperienced in programming. Game logic is not entered by the relative simply table methods used by the other systems, but is very much written as a program. ALPS is, however, ideal for the programmer who wants a specialised language which allows him or her to write complex and sophisticated games.

Plague Planet

Alpine Software have released a major, disc based adventure game called Plague Planet, which I have been testing as a game in its own right, in addition to a demonstration of what the ALPS system is capable of. It scores very highly on the second consideration, since the most flexible and varied types of puzzle construction are shown. As a game it is generally very good indeed, although slightly flawed as I shall explain below. You start the game with your space ship crashed on a planet, only to discover that you along with all the inhabitants have been infected with a plague that will extinguish you all in a few days. You do, however, discover that a cure for all may be achieved by visiting a sequence of other planets to obtain the necessary ingredients. You need to repair your ship, discover the navigational co-ordinates to one of the these planets and get going.

In so far as I have been able to make progress, I have found the atmosphere of the game and most of its puzzles to be quite delightful. Unfortunately, the game is spoiled by the inclusion of a few totally obscure problems whose solution is all but impossible. The problem is exacerbated by a technical fault of providing insufficient feedback on progress. Hence, doing something close to the correct solution, but say with the wrong object, frequently receives only a default message like "You cannot do that" with no indication that you are on the right lines. I got through two of three such blocks by phone calls to the author, then gave up pending the arrival of the long promised – and essential – clue sheet. This arrived (typically) on the day that I had to send this review in. Although the clue sheet will obviously help with the problems discussed, a game should be solvable by an persistent player without need for one, and I hope that the company will test the game with experienced players and rewrite or provide clues to their more obscure puzzles. I have never understood why game writers should wish to prevent

Adventure news – Lancelot

Mandarin Software and Level 9 have combined again to bring us a new adventure for the Master Series. It's called Lancelot and it follows the definitieve book on King Arthur, Sir Thomas Malory's "Le Morte D'Arthur" published by William Caxton in 1485.

Pete Austin of Level 9 says that the £14.95 will be their "best game to date". The pack will include a background story and parchment map of Arthurian England.

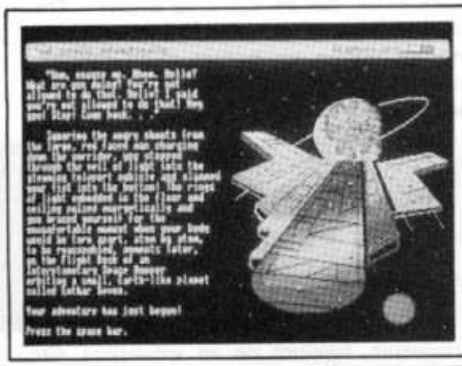
A&B Computing attacked Level 9 last year for dropping out of the BBC market without researching the disk-based 128K machines, which compare favourably with other hardware for which Level 9 were developing. Mandarin are to be congratulated in bringing their market awareness to bear. The A&B adventure campaign seems to have worked.

Archimedes adventures

Few and far between at the moment. Robico's Enthar Seven is certainly finished but as yet not reviewed so we'll whet your appetites with further pictures from the game. The graphics incidentally have been created with Clare's Artisan package.

Heyley – strain your brain – Software have introduced Stranded! for the Archimedes. It's text only but runs "native", not under emulator. The one difference from the BBC Micro version reviewed by Jonathan Evans here may turn out to be the price! Heyley estimate around £20 for the Archimedes version.

Future adventure software development will undoubtedly involve the use of art and sound packages and digitised pictures. We should start petitioning *Magnetic Scrolls* to produce the likes of *The Pawn* and *Guild of Thieves* **immediately**.



players from seeing most of their work in this way. With suitable modification, Plague Planet could be a classic, almost approaching the Enthar Seven class.

Heyley Games

Heyley Software are a company who have produced a series of text only, disc based adventure games using a modified version of our own Adventurescape system into which they have introduced several improvements and extensions. The main advantage of these games is, however, that which we envisaged when developing the system – they are very *large* both in puzzle content and text because of the use of random access disc files. The penalty you pay is that the disc whirrs each time you move to a new location or the system delivers a message, but you soon get used to this and it is a price well worth paying for the extra play. Some while ago, I reviewed the early games from Heyley and was particularly impressed with **Pirate's Peril**. Since then they have sent me several new games including **DreamTime**, **The Taroda Scheme** and most recently **Stranded!**

In general, I can recommend these games as great fun and excellent value for money at £7.95 each (£8.95 for Stranded!). As mentioned above all the games are large with over 200 locations each described in much fuller text than would be possible without the disc file system, and with a great deal of play in them. Big does not necessarily mean good, however, so I should add that the quality of the text is generally high with both descriptions and the plots holding interest well. Puzzle quality is good, if not quite in the Level 9 or Robico class. The obscure difficulty that marks many small games is generally absent and – as with Robico games – it is usually possible to solve problems without too much frustration and keep making progress. The sheer size of the games means that you get many hours of play despite good progress. Even so, I was pleased to see that Heyley have started to issue clues sheets with their games very much of the form that Level 9 supply.

I have just finished playing right through the latest offering, Stranded!, which is a truly excellent game. Completing this large game was a pleasure, not a duty, and testament to the quality of the plot and extensive well written text for sustaining interest. One or two of the puzzles seemed a little obscure – or at least that's my excuse for an occasional peek at the clue sheet. There are, however, a number of ingenious and most satisfying puzzles and the general quality of the text and game design is very high indeed. In brief, the plot is as follows: You are stranded on an alien planet and must initially escape from a doomed spaceship before it explodes. You then then have to survive on an the planet while finding the materials to build yourself another spaceship with which to escape. Life initially revolves around a military fort, though as you solve problems and your status rises you gradually gain access to more places and are eventually allowed out to explore the surrounding countryside.

The game cleverly sustains a day/night cycle based upon game moves rather than real time. Hence as evening passes to night you must sleep and in the morning you are given a limited period of time in which to attend for work. If you skip work then you don't get fed, with fatal consequences (none of your liberal welfare state nonsense on this planet!). However, this ties your movements rather closely to the fort, so you have to discover some alternative food supply in order to get further afield. A very large number of curious objects are to be found most of which have a purpose.

Heyley are threatening to make this their last BBC game and want now to concentrate on the Archimedes. Robico are doing likewise which is at least better than Level 9's new policy of ignoring the Acorn machines altogether. As a programmer I can understand people wanting to write for a more powerful machine, though I am not at all sure that excluding the BBC makes sense in terms of the current state of the marketplace. Anyway, the way things are going either I shall have to get an Archimedes or the editor will have to get a new roundup writer.

FACTFILE

The *PenDown Adventure Writer* is available from Logotron Ltd, Dales Brewery, Cambridge CB1 2LJ, priced £18.40p ☎ (0223) 323 656.

The ALPS system is available from Alpine Software, P.O. Box 25, Portdown, Craigavon, BT63 5UT, as are each of the ALPS Extensions and Extras Pack. Plague Planet is available only as a disc.

Stranded! is priced £8.95 and other games at £7.95 are available from Heyley Software, 24 Ley Hey Road, Marple, Stockport SK6 6PQ (disc only).

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Rick Hughes

CROSS REFERENCER

XREF utility for easier BASIC programming on your Arc

If you write programs in anything other than BASIC you will probably be familiar with the idea of a program cross-reference, hereinafter referred to as 'XREF'. This is an alphabetical listing of all the variable names used in the program together with a list of line numbers showing where they are referenced.

Such a listing is extremely useful for program debugging and at first sight it is an omission from the very powerful Archimedes BASIC. However, this is not really the case – languages that compile or assemble (for example, C) have to keep a table of variables as a matter of course and it is no big deal to print the table out at the end of compilation. BASIC, being an interpreted language is a much more difficult proposition; for example it is quite permissible to have lines full of junk in the middle of a program (though not in yours, of course) and GOTO round them. BASIC will not execute these lines, and as far as it is concerned they do no damage. However if we XREF the program we should expect to pick them up and try to make sense of them as there is no way of knowing that they cannot be executed.

Despite this complication, a good XREF routine is possible for Archimedes and this article describes such a program.

Close relation

You may imagine that XREF is a close relation of LVAR, which the Archimedes does have. However they are very different utilities, each having its own use.

LVAR will provide a listing of all the active variables, together with their values – this is possible because BASIC is obliged to keep just such a list so that it can function properly. As a new variable is encountered it is added to the list and a value assigned to it. With XREF values are not given and we actually read the program (lots of times!) in an attempt to find potential variables before BASIC ever gets to know about them – this is tricky and we shall refer to the process again later as we consider how the routine works.

Now that huge BASIC programs are possible (have a look at some of those on the Welcome Disc) XREF is a valuable utility to have as it is impossible to make sense of a hundred screens-worth of BASIC without some sort of map of the variables you are dealing with.

Using XREF

XREF has been implemented as a utility which means that it resides on disc and can be made available for cross-referencing your program by simply typing *XREF. This causes the code to be loaded into the RMA (Relocatable Module Area) and run from there. This is important as it needs to co-exist with the program it is working on and cannot be allowed to load into memory accessible to BASIC.

If you *EX your disc, you will find that the XRef file is designated a 'Utility' (caused by a *SETTYPE FFC when you saved it); it is worthwhile starting a *utilities* directory containing useful routines like this one if you haven't already done so.

The listing accompanying this article contains the source code for XREF. Once you have run the program (having saved it first!) pressing function key f5 will save a file called 'XRef' on your disc – it is this file that is summoned each time you type *XREF.

Typing *XREF by itself will list *all* 'variables' including numbers; if you require a more selective cross-reference, this is achieved by following the command with a parameter list. The list consists of items which are acceptable as the initial character in a variable or ranges of such characters – note that there should be no spaces between the items in the list. For example, the command:

***Xref a-zABC0-9**

will only cross-reference variables starting with a lower case letter, upper case A, B, or C or the digits 0-9. Notice how the '-' is used to indicate a range of values.

The entries in the list do not need to be in any particular order, but if a range is used, the second item must have a higher ASCII value than the first (so replacing 'a-z' by 'z-a' would cause a 'Syntax Error' message).

XRef is best used in conjunction with a printer and if the program under scrutiny is very large, it is a good idea to print in condensed mode, which should give you about 132 characters per line. To make full use of this feature, the XRef routine will read the screen Mode and, if Mode 16 or 17 is being used, it will use the full width of the paper (which is the same as the screen) for its display, otherwise an 80-column Mode is assumed.

So before you type *XRef, select an 80 or 132 column MODE as required; to send the output to your printer, press <CTRL-B> just before you hit <RETURN>.

XREF at work

Unfortunately one consequence of *XRef being a utility is that it has to be written in assembly language and it is often tedious trying to understand just how a great chunk of assembler achieves what it does. So without going through the listing line by line we shall describe the basic algorithm which is used to implement the routine.

There are two distinct phases to the XREF process: an initial single pass through the program hunting for likely-looking variables. These are then stored at the end of the program, where it would (normally) keep its own lists of variables. Secondly, we look at this list in detail, 'sorting' it and passing the program once for each variable to find out which lines it occurs on.

During the first phase the following happens:

i) The program is searched starting from PAGE, looking for TOP – this is recognised by the high byte of the line number being &FF.

ii) Starting again at PAGE, each line of the program is scanned looking for good variable names. (What constitutes a 'variable' is one

of the most difficult aspects of the program). Any new names are tagged on to the end of the list which starts at TOP and works upwards. Each name is terminated with a 0-byte. Names are only added to the list if they do not appear in it already.

iii) The whole list is ended with &FF.

At this point we know what variables can be found in the program and you might expect the next phase to be a sort. This is not quite the case and we do a kind of 'running-sort' instead. This is grossly inefficient (thank goodness assembler is fast!) but very easy to implement. In effect we sort the list to the screen, forgetting each item ever existed once it has been output and dealt with.

Each item in the list is processed by scanning the program from beginning to end, looking for that specific variable on each line (in the first phase we were looking for *any* variable), and listing line numbers as references are found. Once we have reached TOP, that variable is finished with and we indicate this by overwriting its first byte with &80, thus ensuring that we won't look at it again. Finally when a 'sorting-pass' has been made where nothing was output, all items have been flagged and the routine is finished.

There are as many sorting passes as there are variables and each one starts with a register pointing to an impossibly high value. Now, variables are read from the list (skipping them if they start with &80), and compared against that pointed to by this register. The first one found always wins and so we point the register to that instead and the process continues. Eventually we reach the end of the list with the register pointing to the variable to be processed next. Once the details have been output for this variable, it is flagged and a new pass is made.

Variable in a haystack

Fundamental to this whole program is the idea of finding 'proper' variables in the BASIC program.In a syntactically correct program this is always possible (yet surprisingly complicated) and, as we have already said, in rather more dubious programs we may need to make some intelligent guesses. You might find it interesting to compare how you might go about this process with what I eventually came up with. Each line is read byte-by-byte and some things we need to watch out for are:

- if we find a 'return' code – character &0D, we have reached the next line.
- if we find a 'REM' (tokenised as &F4) or 'DATA' (tokenised as &DC) we can skip the rest of the line – this is about the best thing that can happen!
- if we find a quote '"', toggle a flag (which effectively tells us if we are IN or OUT of quotes), all subsequent tests are only performed if we are out of quotes.
- pick up 'line-number' codes – &8D and skip past the line number. The strange (but sensible) method that BASIC uses to tokenise line numbers (eg after GOTO and RESTORE) means that line numbers may be coded as 'variable-like' names. For example, if you have the program:

1000 GOTO 1000

the Xref routine has to ignore the apparent variable 'dhC' that the second '1000' produces. If you don't believe this, SAVE the program, then *DUMP it.

- ignore assembler comments. This is the hardest thing of all, as they don't behave like BASIC REMs in that they are cancelled by a ':' on the same line. They are indicated by '√' or ';' (the latter is unfortunate since it is valid in a BASIC PRINT statement, so we need to know when we are in assembler before deciding that it indicates a comment field).
- if we ever get this far, anything starting with a letter or digit is deemed to be a variable. Phew!!

Useful

This utility will be of use to all BASIC programmers whose programs extend beyond the limits of the screen. By this stage, it is also likely that the programmer will have access to a printer – perhaps the most useful debugging tool of all – and XRef really comes into its own when a printer is available. A sample of the printout produced is shown in Figure 1; this shows the effect of:

***XREF A-D**

on the source program described in this article. Notice that, whatever the length of the variable's name, the printout is contrived to have the line numbers arranged in neat columns, as this makes the output easier to read. During the first phase, the utility is not interruptable, but once it has started listing, pressing <ESCAPE> will abandon the listing once the data for the current variable has been output.

Finally, a word about timings. Most programs XRef instantly, but the time taken to start producing output (referred to earlier as the 'first phase') is dependent upon the size of the program and the number of suitable variables within it. As an example, a full XRef of our XRef program itself (all 8.7K of it) thinks for only *one* second before it starts churning out its cross-reference. However, if you *XRef the desktop manager program provided with the machine (78K), then you will have to wait 65 seconds before anything appears – quite a difference. Still, if you have the patience to write 78K programs, you can probably spare a minute or so to cross-reference them!

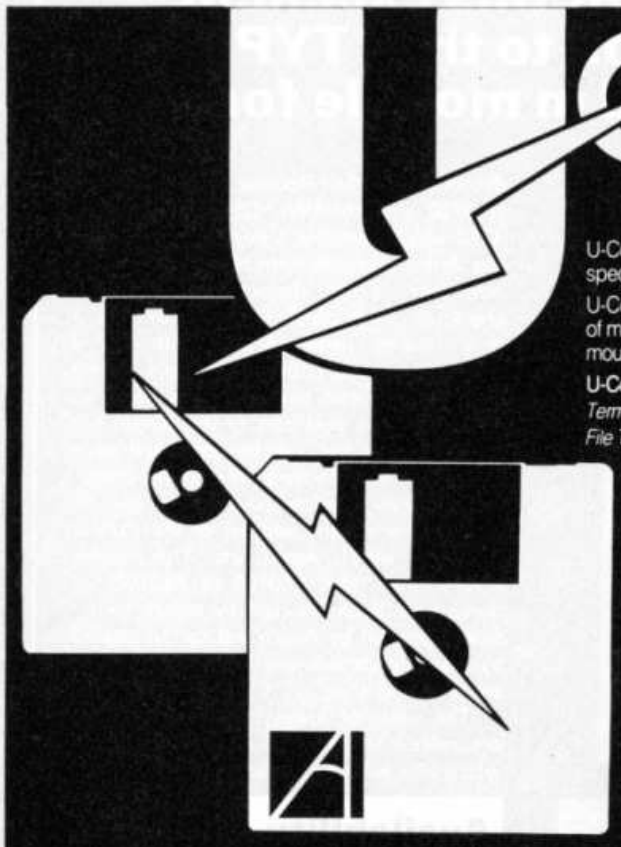
Surprisingly, *XRef A-Z on this same program requires only two second's thought – this is quick by any standards, and it shows that most of the time is spent scanning the list for duplicated variable names, rather than looking through the program for them in the first place.

Rick Hughes has taken to ARM assembler like a fish to water and the results are available on issues 2, 5 and now 6 of the ***Archimedes Computing*** *disc magazine.*

```
   10REM>XREFSource
   20REM XREF BASIC program, a
ssuming [&866C]=PAGE
   30REM (C) A&B 1988
   40
   50REM Syntax:   *XREF [a][b
-c]..........
   60
   70MODE 0
   80DIM Code 2000
   90*KEY 1 EDIT M
  100*KEY 5 PROCutility M
  110
  120REM Register usage
  130 LinBse =4 : LinPtr =5 :
VarPtr =6
  140 TopPtr =7 : Table  =8 :
Flags  =12
  150
  160REM Bit settings
  170 Vflag =1<<28 : Carry  =1
<<29
  180 quote =1 : match =2 : co
lon =4
  190 empty =8 : wide  =16: sq
rb  =32
  200
  210FOR pass%=0 TO 2 STEP 2
  220P%=Code
  230
  240[OPT pass%:
  250 ALIGN
  260
  270.XRef
  280 stmfd  r13!,{r14}
  290
  300\analyse command tail
  310 ldrb r0,[r1],#1
  320 cmp  r0,#ASC" "
  330 ble  GetStarted
  340 cmp  r0,#ASC"-"
  350 beq  SyntaxError
  360
  570.MinLoop
  580 ldrb r2,[Table,r0]
  590 orr  r2,r2,#4
  600 strb r2,[Table,r0]
  610 add  r0,r0,#1
  620 cmp  r0,r3
  630 ble  MinLoop
  640 ldrb r0,[r1]
  650 b    Loopist
  660:
  670.SyntaxError
  680 adr  r0,syntax
  690 b    Errored
  700:
  710.Process
  720 ldrb r0,[Table]
  730 eor  r0,r0,#4
  740 strb r0,[Table],#1
  750 tst  r0,#8
  760 beq  Process
  770
  780;Find TOP (and spot Bad P
rogram) on the way
  370 adr  Table,table
  380.Loopist
  390 cmp  r0,#ASC"z"
  400 bgt  SyntaxError
  410 cmp  r0,#ASC"-"
  420 beq  Minus
  430 cmp  r0,#ASC" "
  440 ble  Process
  450 ldrb r3,[Table,r0]
  460 orr  r3,r3,#4
  470 strb r3,[Table,r0]
  480 ldrb r0,[r1],#1
  490 b    Loopist
  500:
  510.Minus
  520 ldrb r0,[r1,#-2]
  530 ldrb r3,[r1],#1
  540 cmp  r3,r0
  550 ble  SyntaxError
  560
```

```
 790.GetStarted
 800 adr    Table,table
 810 ldr    r0,page
 820 ldr    TopPtr,[r0]
 830 str    TopPtr,page
 840
 850.Xr1
 860 ldrb   r0,[TopPtr]
 870 cmp    r0,#13
 880 bne    Error
  ;let BASIC report 'Bad Progr
am'
 890 ldrb   r0,[TopPtr,#1]
 900 cmp    r0,#&FF
 910 ldrneb r0,[TopPtr,#3]
 920 addne  TopPtr,TopPtr,r0
 930 bne    Xr1
 940
 950 strb   r0,[TopPtr,#2]!
  ;TopPtr has TOP
 960 ldr    LinPtr,page
  ;let's start at the very beg
inning
 970 mov    Flags,#0
  ;to set sqrb to 0
 980
 990.Xr2
1000\Start a line off
1010 ldrb   r0,[LinPtr,#1]
  ;high byte of line number
1020 cmp    r0,#&FF
1030 beq    NextPass
1040 mov    LinBse,LinPtr
  ;remember line start
1050 add    LinPtr,LinPtr,#3
1060
1070.Xr3
1080\Fetch next variable on l
ine
1090 bl     StuffBuff
1100 bcs    Xr2
  ;no more on this line
1110 mov    r10,TopPtr
  ;have we had it before?
1120
1130.Xr4
1140 adr    VarPtr,varbl
1150 bic    Flags,Flags,#matc
h ;..not yet
1160
1170.Xr5
1180 ldrb   r0,[r10],#1
1190 tst    r0,#&80
  ;end of list?
1200 bne    Nomatch
  ;yes - go
1210 ldrb   r1,[VarPtr],#1
1220 cmp    r0,r1
1230 orrne  Flags,Flags,#matc
h ;set failure
1240 cmp    r0,#0
1250 bne    Xr5
1260
1270 tst    Flags,#match
  ;failure?
1280 beq    Xr3
  ;they matched - try next var
iable
1290 b      Xr4
1300:
1310.Nomatch
1320 sub    r10,r10,#1
1330 adr    VarPtr,varbl
1340
1350.Nm1
1360 ldrb   r0,[VarPtr],#1
1370 strb   r0,[r10],#1
  ;add to end of list
1380 cmp    r0,#0
1390 bne    Nm1
1400 mov    r0,#&FF
1410 strb   r0,[r10]
  ;and end list
1420 b      Xr3
1430:
1440\************************
*****************************
************
1450.NextPass
1460 adr    r11,infinity
1470 mov    Flags,#0
  ;to set sqrb to 0
1480 mov    r0,#135
1490 swi    "OS_Byte"
  ;get screen mode
1500 cmp    r2,#16
  ;132 chars?
1510 orrge  Flags,Flags,#wide
  ;yes - say so
1520
1530.Np0
1540 mov    r10,TopPtr
  ;start the running sort
1550 bic    Flags,Flags,#empt
y ;in an empty list
1560
1570.Np1
1580 ldrb   r0,[r10]
1590 cmp    r0,#&FF
  ;finished the list?
1600 beq    Finished
1610 tst    r0,#&80
  ;this one flagged?
1620 bne    LessLoop
1630 orr    Flags,Flags,#empt
y ;say we're still going
1640 mov    r9,#0
  ;displacement
1650
1660.Np4
1670 ldrb   r0,[r10,r9]
1680 ldrb   r1,[r11,r9]
1690 cmp    r0,r1
1700 addeq  r9,r9,#1
1710 beq    Np4
1720 movlt  r11,r10
  ;new least found
1730
1740.LessLoop
1750 ldrb   r0,[r10],#1
1760 cmp    r0,#0
1770 bne    LessLoop
1780 b      Np1
1790:
1800.Finished
1810 tst    Flags,#empty
1820 beq    BaleOut
1830
1840\Found a variable - print
the details
1850 mov    r0,r11
1860 swi    "OS_Write0"
  ;print the name
1870 sub    r1,r0,r11
1880
1890.TabLoop
1900 subs   r1,r1,#6
1910 bpl    TabLoop
1920 adr    r0,spaces
1930 mvn    r1,r1
1940 add    r1,r1,#2
1950 swi    "OS_WriteN"
1960 ldr    LinPtr,page
1970
1980.Afv1
1990\Scan the program for it
2000 ldrb   r0,[LinPtr,#1]
  ;high byte of line number
2010 cmp    r0,#&FF
2020 beq    ThatsAllFolks
2030 mov    LinBse,LinPtr
  ;remember line start
2040 add    LinPtr,LinPtr,#3
2050
2060.Afv3
2070\Fetch next variable on l
ine
2080 bl     StuffBuff
2090 bcs    Afv1
2100 adr    VarPtr,varbl
  ;variable found - the one we
want?
2110 mov    r9,#0
2120
2130.Recheck
2140 ldrb   r0,[VarPtr,r9]
2150 ldrb   r1,[r11,r9]
2160 cmp    r0,r1
2170 bne    Afv3
  ;mismatch - this ain't it
2180 cmp    r0,#0
2190 addne  r9,r9,#1
2200 bne    Recheck
2210
2220 mov    r0,#134
  ;it's on this line
2230 swi    "OS_Byte"
  ;where are we?
2240 mov    r0,#74
  ;assume narrow line
2250 tst    Flags,#wide
  ;..but is it?
2260 movne  r0,#126
2270 cmp    r1,r0
2280 blt    NoFeed
2290 swi    "OS_WriteS"
  ;no room - next line
2300 EQUB 13:EQUB 10
2310 EQUS "      "
2320 EQUB  0
2330
2340.NoFeed
2350 ldrb   r0,[LinBse,#2]
;low byte of line number
2360 ldrb   r1,[LinBse,#1]
;high byte of line number
2370 orr    r0,r0,r1,lsl #8
2380 adr    r1,buffer
2390 mov    r2,#5
2400 swi    "OS_BinaryToDecim
al"
2410 rsb    r1,r2,#6
2420 adr    r0,spaces
2430 swi    "OS_WriteN"
2440 adr    r0,buffer
2450 mov    r1,r2
2460 swi    "OS_WriteN"
2470 ldrb   r0,[LinBse,#3]
  ;go to next line
2480 add    LinPtr,LinBse,r0
2490 b      Afv1
2500:
2510.ThatsAllFolks
2520 mov    r0,#&80
  ;flag this one as used
2530 strb   r0,[r11]
2540 swi    "OS_NewLine"
2550 swi    "OS_ReadEscapeSta
te"
2560 bcc    Np0
2570 mov    r0,#126
2580 swi    "OS_Byte"
2590
2600.Error
2610 adr    r0,errmess
2620
2630.Errored
2640 teqp   pc,#Vflag
2650
2660.BaleOut
2670 ldmfd  r13!,{pc}
2680:
2690:
2700\Find next variable in a
GOOD line and stuff it into th
e varbl buffer
2710\On exit, C=0 means every
thing is OK
2720\         C=1 means we ha
ve hit end of line
2730.StuffBuff
2740 bic    Flags,Flags,#colo
n+quote
2750
2760.SB1
2770 ldrb   r0,[LinPtr,#1]!
2780 cmp    r0,#13
  ;&0D?
2790 beq    EndOfLine
2800 cmp    r0,#&F4
  ;REM?
```

```
 2810 beq    EndOfLine
 2820 cmp    r0,#&DC
  ;DATA?
 2830 beq    EndOfLine
 2840 cmp    r0,#ASC""""
  ;quote?
 2850 eoreq  Flags,Flags,#quot
e
 2860 beq    SB1
 2870 tst    Flags,#quote
 2880 bne    SB1
 2890 cmp    r0,#&8D
  ;line number marker?
 2900 addeq  LinPtr,LinPtr,#3
  ;yes - skip it
 2910 beq    SB1
  ;and proceed
 2920 cmp    r0,#ASC"\"
  ;\?
 2930 orreq  Flags,Flags,#colo
n
 2940 beq    SB1
 2950 cmp    r0,#ASC":"
  ;colon?
 2960 biceq  Flags,Flags,#colo
n
 2970 beq    SB1
 2980 tst    Flags,#colon
 2990 bne    SB1
 3000 cmp    r0,#ASC"["
  ;assembler?
 3010 addeq  Flags,Flags,#sqrb
 3020 beq    SB1
 3030 cmp    r0,#ASC"]"
  ;assembler exit?
 3040 bne    SB2
 3050 tst    Flags,#7*sqrb
 3060 subne  Flags,Flags,#sqrb
 3070 b      SB1
 3080
 3090.SB2
 3100 cmp    r0,#ASC";"
  ;?
 3110 orreq  Flags,Flags,#colo
n
 3120 beq    SB1
 3130 cmp    r0,#ASC"z"
 3140 bgt    SB1
 3150 ldrb   r3,[Table,r0]
 3160 tst    r3,#1
 3170 beq    SB1
 3180 adr    VarPtr,varbl
  ;variable found!
 3190
 3200.VrblLoop
 3210 strb   r0,[VarPtr],#1
  ;fetch name..
 3220 ldrb   r0,[LinPtr,#1]!
  ;..to buffer
 3230 cmp    r0,#ASC"("
 3240 streqb r0,[VarPtr],#1
 3250 beq    Arrayed
 3260 cmp    r0,#ASC"z"
 3270 bgt    Arrayed
 3280 ldrb   r3,[Table,r0]
 3290 tst    r3,#2
 3300 bne    VrblLoop
 3310
 3320.Arrayed
 3330 sub    LinPtr,LinPtr,#1
 3340 adr    r2,varbl
 3350 ldrb   r0,[r2]
 3360 ldrb   r3,[Table,r0]
 3370 tst    r3,#4
 3380 bne    SB1
 3390 mov    r0,#0
  ;terminate with 0
 3400 strb   r0,[VarPtr]
 3410 tstp   pc,#Carry
  ;clear carry
 3420 mov    pc,r14
 3430:
 3440.EndOfLine
 3450 ldrb   r0,[r4,#3]
 3460 add    LinPtr,LinBse,r0
 3470 teqp   pc,#Carry
  ;set it
 3480 mov    pc,r14
 3490:
 3500:
 3510.table
 3520\    Codes &00-&2F
                ....$%&'........
 3530EQUS"00000000000000000000
00000000000000233300000000"
 3540\    0123456789......@ABC
DEFGHIJKLMNOPQRSTUVWXYZ....
 3550EQUS"33333333300000003333
33333333333333333333300002"
 3560\    .abcdefghijklmnopqrs
tuvwxyz
 3570EQUS"03333333333333333333
33333339"
 3580
 3590ALIGN
 3600.page      EQUD &866C
 3610.infinity EQUD -1
 3620.buffer    EQUS "01234567"
 3630.spaces    EQUS "         "
 3640.errmess   EQUD 0:EQUS "Xr
ef terminated":EQUB 0
 3650.syntax    EQUD 0:EQUS "Pa
rameter error":EQUB 0
 3660.varbl     EQUB 0
 3670:
 3680.End
 3690:]
 3700NEXT
 3710
 3720PRINT " f1 to edit"
 3730PRINT " f5 to save as uti
lity"
 3740END
 3750
 3760DEFPROCutility
 3770OSCLI("SAVE XRef "+STR$~C
ode+" "+STR$~(End))
 3780*SETTYPE XRef FFC
 3790ENDPROC
```

U-CONNECT

Communications Software for Acorn Archimedes computers

U-Connect is a general-purpose, but full-featured communications software package written specifically for the Archimedes range of computers, using a combinations of assembler and 'C'.

U-Connect runs exclusively within the Archimedes WIMP environment, fully utilising the concepts of multiple windows, icons, and pop-up menus to provide an easy-to-use, flexible, and attractive mouse-driven package.

U-Connect provides:

Terminal Emulations – Teletype, VT52, VT100 and VideoTex (Prestel)

File Transfers – ASCII, X-Modem, Kermit, CET (Prestel Download)

Screen Review – view past text/frames in separate scrolling window.

Modem Drivers – support for all common types of modems, fully user configurable (Hayes, Dacom, Pulsed, and Dumb supplied as standard).

PhoneBooks – Multiple phonebooks allowed, each with 40 entries, defining phone numbers, logon, function keys etc., allowing the complete environment to be pre-configured automatically before connection.

U-Connect is ideal for the Archimedes User who wishes to connect to remote computer services, such as Bulletin Boards, Online Databases, Conference Systems, E-Mail systems etc. It is supplied on 3.5" disk, with a comprehensive user manual covering all aspects of the package.

U-Connect is the first in a range of Magenta Research software packages planned for the Archimedes over the coming months.

Price: £59.95 inc VAT & p+p (outside UK add £4 p+p) Send cheque or PO to:

MAGENTA RESEARCH LTD

5th Floor, Amp House, Dingwall Road, Croydon, CR0 9XA, United Kingdom
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TYPE-EASY

Implement this excellent extension to the *TYPE command in module form

Alan Barclay

TypeEasy

The Acorn Disk Filing Systems, including the Advanced Disk Filing System, have always included the *LIST and *TYPE commands which display the contents of a named file in an ASCII format. In their limited way they are quite useful but how often have you found yourself struggling to hit the <CTRL> and <SHIFT> keys as the very lines you were looking for have gone streaming off the top of the screen. Your fears are now over thanks to this utility which allows you to scroll around the file and also select sections for printing.

The following ARM Assembly Language program written in BASIC will generate the machine code, which takes the form of a Relocatable Module and then save it to disk. When the Module is resident in your machine you will find that it will now respond to the following commands :

***Copyright (no parameters) :**
This prints the name and version of the module along with the time and date that it was assembled.

***TF <filename> and *TypeFile <filename> :**
This starts the application by loading the file into memory and setting up the screen with the status shown on the bottom two lines. The file is loaded into the top of memory just below HIMEM. This means that provided your current application is not using all of the memory available in your machine it is unlikely that your data machine will be destroyed.

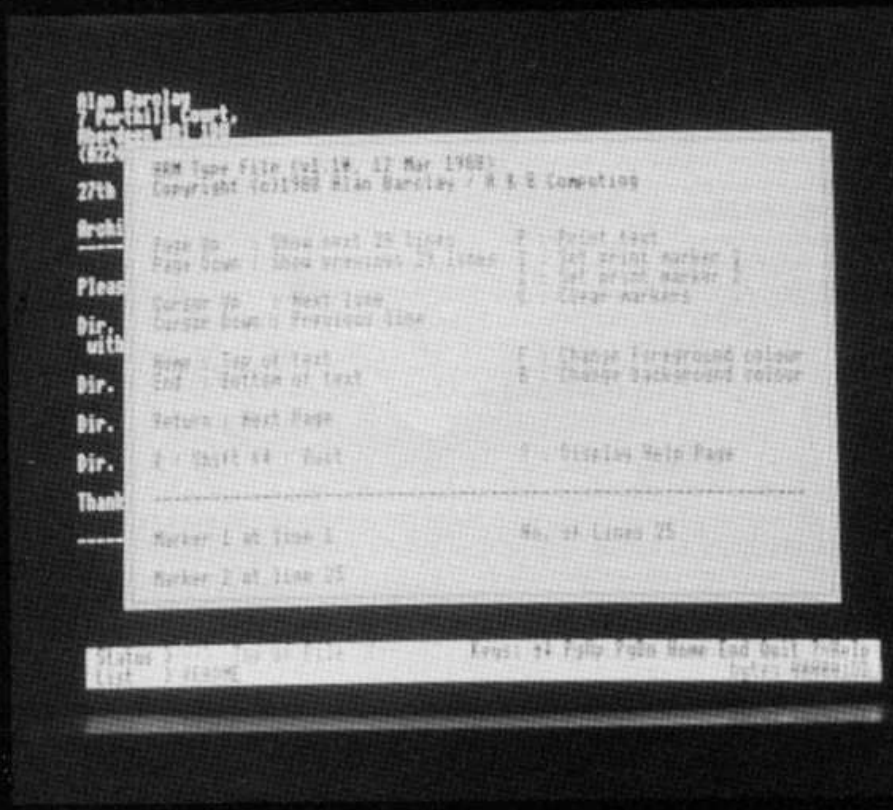
If you enter *TF then any unprintable characters, ie those with ASCII values less than 32 or greater than 126 with be replaced with a space (character 32). Instead if you enter *TypeFile then any unprintable characters will be displayed with character 189 which is a floating full stop.

The status line displays the current filename, length of the file in bytes, the number of the line which is at the top of the screen (or Top of File or End of File) and a few of the keys which are used. Pressing '?' or simply '/' will display a help page which contains the following information:

Key : Action

Page Up : Show the next 29 lines
Page Down : Show the previous 29 lines
Cursor Up : Show next line
Cursor Down : Show previous line
Home : Goto Top of text
End : Goto Bottom of text
Return : Display Next Page (next 30 lines)
P : Print marked text
1 : Set print marker 1
2 : Set print marker 2
C : Clear markers
F : Change foreground colour
B : Change background colour
Q or **SHIFT f4** : Quit to previous application
? : Display Help Page
No. of Lines : Total number of lines in text
Marker 1 at line : Position of marker 1
Marker 2 at line : Position of marker 2

Further functions could easily be added to the software by inserting the new routine at the end of the assembly language and a key detect in the Main Routine loop, lines 3150 to 3720, after the SWI "OS–ReadC" in line 3210 which waits for a key press. The new key detect takes the form of TEQ R0,ASC#" new–key" (Test character in R0 with character in quotes) followed by BLEQ new–routine–name (Branch with link if equal to routine–name). Registers R1-R9 can be corrupted but all others must be preserved. The text part of the screen but not the status line, can be corrupted since this will be redraw before the next key press.



The draw window routine can also be used by passing the address of the data as shown in wind1, wind2, etc. The module errors range from &60100 to &60103 but these have been selected by myself rather that appointed by Acorn and so can altered by changing variable *err–base* in line 150 if any problems arise.

The value of lowest% also in line 150 determines the address of memory under which a file will not be loaded.

Availability

The *typefile command relocateable module is available on Archimedes Computing disc 6. See the advert in this issue.

Alan Barclay

MODULE MAKER

A relocatable module is a piece of ARM Machine Code which, when installed in the machine, may introduce a new application program or an extension to the operating system. These are similar to the ROMs which are found in BBC microcomputers and provide similar facilities such as filing systems, languages, OS–Byte and OS–Word calls and new Star (*) Commands. They are designed to run anywhere within a part of memory called the RMA (Relocatable Module Area) and so their code must be relocatable. The Programmers Reference Manual (2) should be consulted for further information on Modules.

Easier than the Beeb

The OS (Operating System) provides a module enviroment which is much easier to use than that which was provided for BBC ROMs. For example, the code which recognizes star commands is built into the OS and need not appear in each module as it did with ROMs. The following ARM Assembly Language program (ModHDR) provides a system which could be adopted for writing a Relocatable Module and also provides many examples of the techniques which will be referred to during this text.

Typing *HELP commands <CR> into your Archimedes will provide a list of the commands which are recognized by the modules installed in the machine. The MOS Utilities module includes the following SWI and star commands specifically for using modules:

***Modules *RMClear *RMKill *RMLoad *RMReinit *RMRun *RMTidy *Unplug**

The meanings of these commands can be found by typing

***HELP <command name> <RETURN>**

The procedure for writing a module is explained below.

SWI OS–Module (&1E)

This call is used to perform various module operations which are required for implementing modules and also provides some error checking.

***Syntax**: On entry R0 = action code, R1,2, = parameters*

The main action codes are:

0: Run (Load and enter a module via start address) 1: Load (Load a module) 2: Enter (Enter a module) 3: Relnit (Resets a module – clearing workspace) 4: Delete (Removes a module – freeing workspace) 5: Describe RMA (Returns RMA Information) 6: Claim (Claim workspace) 7: Free (Free workspace) 8: Tidy (Tidies workspace) 9: Clear (Removes all modules in RAM) 10: Insert in-store module 11: Make RMA module from store area 12: Extract module information 13: Extend Block

Module Header Format

This table (see program lines 360-500) tells the system information such as the module name and where the necessary routines can be found within the module code. All modules must have fields upto &18 although any of these offsets, apart from the title can be zero which means that the module isn't interested in that part.

If an error occurs within a module then R0 should point to the error data, appropriate registers should be preserved and control returned to the caller with the V flag set (lines 1020-1050). Module specific errors (lines 880-940) are given numbers starting at a base number (line 2390) for that module. This number should be requested from Acorn for compatibility reasons.

Writing a module – the easy way

Title String

This is the name (line 2430) which identifies the module to the OS and is displayed by entering the *Modules command. The string should be terminated with a null character and kept fairly short.

Help String

This is the string is printed by *Help Modules and *Help Commands and should take the standard form :

Module name v.vv (DD MMM YYYY)

as generated in the program by variable *mod–help$* (lines 2410 & 2450).

Start Code

This is only used when the module is to be entered as the current application. An offset of zero implies that it cannot be started as an application. If any of the bits in the top byte of the offset are set then the OS will interpret this as an instruction and execute it. For example, this could be a branch instruction which would be useful for testing.

Initialisation

This code is called when the module is loaded or reinitialised. It is used to setup enough information to make the module safe to use. Normally this would involve requesting workspace, intercepting vectors or reading the machine status. Init no.1 (lines 1340-1350) provides no initialisation atall when the module is loaded. Init no.2 (lines 1390-1500) simply displays the module name (init text from lines 660-760) followed by the word "Installed".

For a module to be useful it is likely that it will need some private workspace in which to store values. All modules are given a single word of workspace but if this is not enough then further workspace can be claimed using OS–Module R0=6 and the single byte is then used as a pointer to the extra workspace. Init no.3 (lines 1540-1890) displays the module name and checks for reinitialisation displaying the appropriate message otherwise it requests workspace% bytes (line 2380) of workspace. If this request fails then it prints "Install Aborted" and returns with error0 (lines 880-900).

Finalisation

This is called when an module is about to be deleted by a *Clear* code or when a module with the same name is being loaded. It gives the module a chance to refuse to be deleted perhaps because it is the active application, filling system or includes vital data.

Help and Command Keyword Table

This table (lines 1120-1270) is used when OSCLI, *Status, *Configure and *Help wish to look for unknown keywords. The table contains a list of keywords with offsets to their associated help string, syntax string and piece of code and also an information word. The table should be repeated as often as there are new commands to be entered and then terminated with a zero byte. The command name should be a null terminated string of letters which may contain the underscore character. The OS will scan the command table in each module automatically when there is an unknown command. If it matches the command it will start execution

from its code start address otherwise it will give a *Bad Command* error. The help text is also displayed automatically when a help command is matched.

The *Information* word defines the maximum and minimum number of parameters for the module, if any of the parameters should be passed through the OS–GST (General String Translation) and a byte of flags. One of the flags allows a piece of code to be called (lines 1990-2130) in response to a *Help keyword rather than simply printing the string.

Service Call Handler

The service call handler is entered when an OS service is issued or via an OS–ServiceCall (was OS–Byte &8F). The OS–ServiceCall can be used by any program which wishes to pass a service around the current modules. This allows service calls to be recognized and acted upon by a module which can claim the call to prevent other modules from acting on it.

***Syntax**: On entry R1 = service number, R12,13 = private workspace, stack*
On exit R1 = 0 if call claimed, R2 may return a result

The common Service Numbers are:
&00 : Service call claimed &04 : Unknown command &06 : Error &07 : Unknown OS–Byte &08 : Unknown OS–Word &09 : *Help &0B : Release FIQ &0C : Claim FIQ &11 : Memory &12 : StartUp Filing System &27 : Reset &28 : Unknown *Configure (Use command table instead) &29 : Unknown *Status (' ' ' ') &2A : Application about to start

SWI (SoftWare Interrupt)

The modules also provide a method for providing new SWIs (SoftWare Interrupts) which behave exactly like those already present in the machine however this is beyond the scope of this introductory article.

The procedure *info* and function *command* demonstrates how the module strings should be created to comply with the Acorn standard. Quite often when using the ADR directive in assembly language the Bad Immediate Constant error is generated. This can be avoided by either proceding the label with an ALIGN or by moving the label and its data closer to the ADR itself.

This should set you up for programming some interesting and useful modules for the Arc. If you come up with any you feel may be of use to other readers, do send them in to us at the Editoial address. Mark your envelope MODULES.

```
   10REM >ModPROG1
   20REM ARM Program Module Ge
nerator (Assembly Language onl
y) v.1.01
   30REM Written by Alan Barcl
ay (06/04/88 to 10/04/88)
   40REM ARM BBC BASIC V only
   50
   60ON ERROR MODE 0 : REPORT
: PRINT;" : Error ";ERR;" (&";
~ERR;") at line ";ERL : ON ERR
OR OFF : END
   70MODE 0 : OFF
   80DIM block% 256
   90DIM code% &10000 : REM In
crease size as required !
  100
  110PROC_screen
  120PROC_info
  130PROC_assemble
  140
  150*K.1 RUN M
  160*K.2  MLIB* MTWIN M
  170*K.4 ED. M
  180
  190REPEAT
  200INPUT '"Module Filename :
 "save_file$
  210PRINT '"Save Module : ";s
ave_file$;" (y/n) ";
  220answ = GET : IF answ > 32
 THEN PRINT CHR$(answ)
  230UNTIL (answ = ASC"y") OR
(answ = ASC"Y") OR (answ = 13)
  240
  250PRINT '"Saving Module ...
 ";
  260OSCLI "SAVE " + save_file
$ + " " + STR$~(code%) + " " +
 STR$~(put%)
  270OSCLI "SETTYPE " + save_f
ile$ + " FFA"
  280
  290MODE0
  300PRINT"Finished at ";RIGHT
$(TIME$,8);" on ";LEFT$(TIME$,
15)
  310END
  320
  330DEF PROC_assemble
  340PRINT '"Assembling :"
  350FOR pass% = 0 TO 3 STEP 3
  360P% = code% : REM P% insig
nificant for Relocatable Code
Assembly
  370[ OPT pass%
  380EQUD     0
      ; MODULE HEADER INFO
  390EQUD     (init - code%)
  400EQUD     0 : EQUD 0
  410EQUD     (title - code%)
  420EQUD     (mod_help - code%
)
  430EQUD     (hc_table - code%
)
  440EQUD     0 : EQUD 0 : EQUD
 0 : EQUD 0
  450
  460.title
  470EQUS     title$ : EQUB 0:
ALIGN
  480
  490.mod_help
  500EQUS     mod_help$ : EQUB
0 : ALIGN
  510
  520.in_str
  530EQUS     "  ==> Installed"
 : EQUB 0
  540
  550.help_str
  560EQUS     help$ : EQUB &0D
: EQUB &0D : EQUB 0 .
  570
  580.info_11
  590EQUS     info_11$ : EQUD 0
  600
  610.info_str
  620EQUS     file_info$ : EQUB
0
  630     .
  640.go
  650EQUS "go " + STR$~(exec%)
: EQUB 0 : ALIGN
  660
  670.dload
      ; Prog data for MOVE ro
utine
  680EQUD     load%
  690
  700.dlength
  710EQUD     file_length%
  720
  730.hc_table
  740EQUS     invoke$ : EQUB 0
  750ALIGN
  760EQUD     (mod_code - code%
)
  770EQUD     &20000000
      ; Exec HELP code. no pa
rams
  780EQUD     0
  790EQUD     (help - code%)
  800EQUD     0
  810
  820.help
  830STMFD    (SP)!,{R0,R14}
  840ADR      R0,help_str
  850SWI      "OS_PrettyPrint"
  860ADR      R0,info_11
  870SWI      "OS_Write0"
  880SWI      "OS_NewLine"
  890SWI      "OS_NewLine"
  900ADR      R0,info_str
  910SWI      "OS_Write0"
  920SWI      "OS_NewLine"
  930LDMFD    (SP)!,{R0}
      ; clear R0 - to stop HE
LP * 2
  940MOV      R0,#0
  950LDMFD    (SP)!,{PC}
  960
  970.init
  980STMFD    (SP)!,{R0,R14}
  990ADR      R0,mod_help
 1000SWI      "OS_Write0"
      ; write Module version$
 1010LDR      R0,[R12]
      ; get ws *ptr
 1020TEQ      R0,#0
 1030ADREQ    R0,in_str
      ; if ws* = 0 init$
 1040SWIEQ    "OS_Write0"
 1050MOVEQ    R0,#&1C
      ; ws* at &1C Never Used
(FIRQ)
 1060STREQ    R0,[R12]
 1070SWI      "OS_NewLine"
 1080LDMFD    (SP)!,{R0,PC}
 1090
 1100.mod_code
 1110STMFD    (SP)!,{R0-R11,R14
}
 1120ADR      R5,prog
      ; where the data is com
ing from
 1130ADR      R6,dload
      ; where the data is goi
ng
 1140ADR      R7,dlength
      ; the number of bytes
 1150LDR      R6,[R6]
 1160LDR      R7,[R7]
 1170MOV      R9,#0
      ; loop counter
 1180
 1190.move
 1200LDR      R10,[R5,R9]
 1210STR      R10,[R6,R9]
 1220ADD      R9,R9,#4
 1230CMP      R9,R7
 1240BLT      move
 1250LDMFD    (SP)!,{R0-R11}
      ; Restore regs (Keep LI
NK in LINK)
 1260LDMFD    (SP)!,{R14}
 1270
 1280.start_app
 1290ADR      R0,go
      ; *GO (exec%) addr
 1300SWI      "OS_CLI"
 1310SWI      "OS_Exit"
      ; Incase code returns !
!
 1320
 1330EQUS     "--xxxx--"
 1340.prog
      ; Program is appended h
ere.
 1350]
 1360NEXT pass%
 1370
 1380PRINT '"Module Code : ";
~code%;" to ";~(P% - 1);" (&";
~(P% - code%);")"
 1390put% = P% + file_length%
 1400PRINT '"Reading " + load_
file$ + " ... "; : REM Add fil
e to end of code.
 1410OSCLI "LOAD " + load_file
$ + " " + STR$~(P%)
 1420PRINT '"File        : ";
~P%;" to ";~put%;" (&";~(put%
- P%);")"
 1430ENDPROC
 1440
 1450DEF PROC_info
 1460SP = 13
 1470date$ = MID$(TIME$,5,11)
 1480title$ = "PM-"+file$
 1490mod_help$ = "Program Modu
le a1.01 ("+date$+") (c) Alan
Barclay"
 1500
 1510INPUT '"Enter the Program
 invoke command : *"inv$
 1520IF inv$ = "" THEN
 1530 invoke$ = "Runprog"
 1540ELSE
 1550 invoke$ = CHR$(ASC(LEFT$
(inv$,1)) AND &DF)
 1560 FOR i% = 2 TO LEN(inv$)
 1570  invoke$ = invoke$ + CHR
$(ASC(MID$(inv$,i%,1)) OR &20)
 1580 NEXT i%
 1590ENDIF
 1600
 1610help$ = "*" + invoke$ + "
 (no parameters) will execute
the Assembly Language program
stored in this module."
 1620info_11$ = "Program data:
"
 1630ENDPROC
 1640
 1650DEF PROC_screen
 1660PRINT TAB(10) STRING$(60,
"-")
 1670PRINT ' TAB(12) "Program
Module Generator - Assembly La
nguage only v.1.01"
 1680PRINT ' TAB(10) STRING$(6
0,"-")
 1690PRINT TAB(29) "Written by
 Alan Barclay"
 1700PRINT ' STRING$(80,"-")
 1710VDU28,0,31,79,8 : CLS
 1720
 1730REPEAT
 1740INPUT '"Drive (0) : "driv
e$
 1750IF drive$ = "" THEN drive
$ = "0"
 1760OSCLI "drive " + drive$
 1770
 1780INPUT '"Directory : $."di
r$
 1790IF dir$ <> "" THEN dir$ =
 dir$ + "."
 1800
 1810REPEAT
 1820INPUT '"Filename : "file$
 1830UNTIL (file$<>"") AND (IN
STR(file$,".") = 0)
 1840load_file$ = "$." + dir$
+ file$
 1850
 1860PRINT'"Read File : ";load
_file$;" (y/n) ";
 1870answ = GET : IF answ > 32
 THEN PRINT CHR$(answ)
 1880UNTIL (answ = ASC"y") OR
(answ = ASC"Y") OR (answ = 13)
 1890
 1900$block% = load_file$
 1910SYS "OS_File",&05,block%
TO object%,,load%,exec%,file_l
ength%,file_attribs%
 1920IF (object% <> 1) THEN ER
ROR &D6,"File not found"
 1930IF (file_attribs% MOD 2)
= 0 THEN ERROR &BD,"Access vio
lation"
 1940IF (load% AND &FFF00000)
= (&FFF<<20) THEN load_type% =
 ((load% AND &000FFF00)>>8) EL
SE load_type% = 0 : REM Get fi
le type or 0 if addresses
 1950IF load_type% = &FF8 THEN
 load% = &8000 : exec% = &8000
 ELSE IF load_type% <> 0 THEN
ERROR &C4,"Incorrect File Type
"
 1960
 1970VDU 21
 1980OSCLI "SPOOL !MODdata"
 1990OSCLI "INFO "+ load_file$
 2000OSCLI "SPOOL"
 2010VDU 6
 2020file_info$ = ""
 2030file% = OPENIN "!MODdata"
 2040REPEAT
 2050file_info$ = file_info$ +
CHR$(BGET#file%)
 2060UNTIL EOF #file%
 2070CLOSE #file%
 2080OSCLI "DELETE !MODdata"
 2090file_info$ = LEFT$(file_i
nfo$,11) + "--" + MID$(file_in
fo$,14,40)
 2100ENDPROC
```

Welcome!

Special editorial message:

Strange reports reach us this month from our phantom columnist, The Arcade Ace. It seems that an "unavoidable combination" of moving house, having no new games to play and no letters from readers to share with you means that The Arcade as we know it cannot be with us this issue.

Personally, we don't believe a word of it.

However, in the interests of the long-planned but as yet unrevealed "Special Games Issue" of A&B, we have decided to be lenient and let him get away with it. This time.

Game of the month

There is no Game of the Month. No compilation, no new *Repton*, no nothing.

Game Reviews

Er, Sorry Gang, I don't quite know how to put this guys but...there are no game reviews. For some reason, software houses have decided that July means holidays, holidays mean hard-earned money spent on other things, hard-earned money spent on other things means empty computer shops, and empty computer shops means it's not worth releasing anything.

Even if they **had** something to release which, apparently, they haven't. Oh, I know the magazines are full of large colour ads for *The Empire Strikes Back*, there should be at least two hundred games "under development" from Superior up in Leeds and so on (Remember last month? Ed) Meanwhile, zilch.

Bolo Update

Not so much an update, more a piccy that should have been here last month. It shows the stunning new multi-user game running on eight BBCs in the Cambridge University computing laboratory. As you should be able to see, different players can be in different parts of the landscape whilst still interacting.

Hints 'n' Tips

A number of goodies have been lying under my keyboard for a while and this seems a good time to share them with a wider audience. Hope they help.

Plan B

This sneaky little program from "Optimus" allows you both infinite energy and ammunition, as well as an option to do away with keys and computer parts, in Bug-Byte's excellent *Plan B*, of course.

Just type in *Listing 1*, RUN it, and cheat away. Note – this will only work on the tape version.

POKEing with confidence

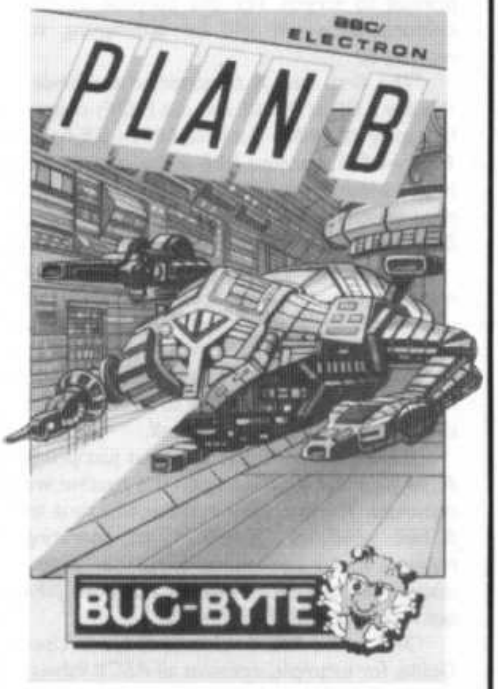
One of the most common requests I get every month is – How do you work out a poke?

Of course, the subject is wide-ranging and could, at times, get us into tricky areas – remember that to break into many games will involve sidestepping or destroying the software house's protection. I still don't really understand just what we are and are not allowed to do in this area but, as far as I understand, nobody will mind too much if you are converting tapes you own to disks that you will keep. Start to pass them on (or sell them – hiss!) and the water muddies.

Anyway, *Richard Koten* has sent in a number of very useful pokes and he outlines here one way of devising them. Any other hints along the same lines are welcomed.

"I would like to suggest another way for finding pokes for games. If you replace the three bytes used for a JSR with &EAs (NOP) and then play the game, you should be able to find that something that should have happened has not. Kep doing this on the routine you removed until the routine you get to has no JSRs in – now you can try experimenting.

"Try different values within the routine and see what happens. As an example, look at the following:



Dave Reeder

THE ARCADE

In fact, it's probably better not to have the Beebs in a line like this so you can't look left and right at other screens!

Now don't you wish you had that many BBCs to play with? Or even that many friends? A wonderful thing, university life.

Ever imagined A&B Computing without a decent Arcade? Imagine no longer – just read on!

```
1900 20 09 19 JSR &1909
1903 A9 43 LDA #&43
1905 20 EE FF JSR &FFEE
1908 60 RTS
1909 A2 41 LDX #&41
190B 20 0F 19 JSR &190F
190E 60 RTS
190F 8A TXA
1910 20 EE FF JSR &FFEE
1913 E8 INX
1914 E0 43 CPX #&43
1916 D0 F7 BNE &190F
1918 60 RTS
```

"If you type CALL &1900, ABC will be printed to screen. For the purpose of this demonstration we will be attempting to remove B.

"The first step is to examine the code. We see a JSR at &1900 and put NOPs over it by typing **?&1900=&EA:?&1901=&EA:?&1902=&EA,** because &EA is the opcode for NOP. Now type CALL &1900 and C will print to screen. We've succeeded in removing B but have also removed A!

"Before we go any further we would normally reinstate the JSR by reloading the program or by poking the the original values back in. Now let's examine the routine pointed to by the JSR we removed – this also has a JSR in it so we remove it, as before, but this time work out how yourself.

"Calling the execution address just prints A, so we must examine again the routine we removed. This has a JSR in it but this time to &FFEE which is OSWRCH, an operating routine, so we can ignore it. Further examination of the routine reveals no more JSRs but it does contain CPX #&43.

"&43 is the ASCII value of C (your User Guide, for example, contains all ASCII values) and is the only number in the routine – let's replace it with a number. Type ?&1915=&42, then reinstate the JSR to this routine and CALL &1900.

"Success! It prints AC. This is, of course, a very simple example and games will normally be much harder. But it should make the principle easier to understand. Try it yourself on a game."

POKEing with confidence, Part 2

And, for those of you in despair because you can never get pokes to work, here are two easy programs to help you use the pokes run in The Arcade. Remember these are for poking use only, not for software piracy.

The first should be used for values that are given for particular games. For example: *Chuckie Egg:* ?&2BFD=255 (255 lives), ?&2BF9= (start level). To use such data, you must write a small program and load it and run it before the main program of the game. In this case:

```
10PAGE=&6000
20?&2BFD=255
30?& 2BF9=(level)
40*LOAD""
50CALL
(start address)
```

Note firstly, that this is for tape. For disc you would have to name the program to be loaded and, secondly, that the start address can be found using *OPT1,2 on tape and *INFO *.* on disc.

The second is more useful for locked programs, when you have to sidestep the protection. Enter and run this:

```
10P%=&70
20[OPT2
30LDA&3CA
40AND&254
50STA&3CA
60JMP&DC83
70]
80?&204=&70:?&205=0
90*TAPE
100*OPT1,2
110*LOAD""
```

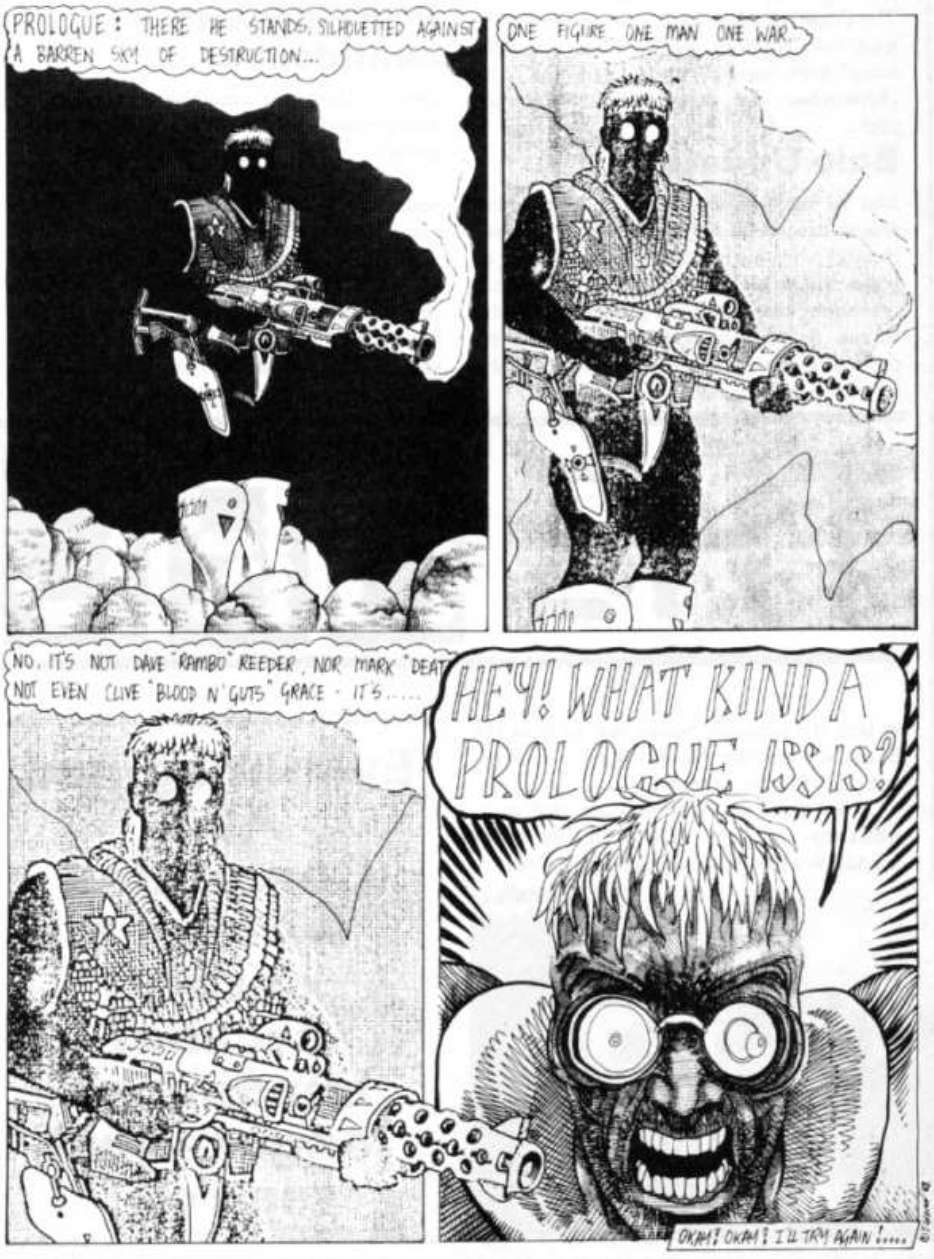
Replay It Again, Sam

I hope you all know of Vine Micro's Replay – a ROM-based solution to tape-to-disc transfer that does not encourage piracy because it codes the transferred game. To play the game from disc you must have the same Replay ROM in your machine – swopping discs won't work.

However, there are some games – *Nightshade, Lunar Jetman* and *Just about everything Gary Partis has coded – that detect the presence of the Replay ROM in your Beeb, even when software disabled, and then refuse to run until you take the ROM out. Anyone who has plugged a ROM in and out a few times will know how fragile the little legs are and how distaught a games player becomes when such little disasters occur.*

Help is at hand, though, from James Butterworth. He contacted Vine and was given an option – return the ROM to them for reprogramming or install a switch. He chose the second option and I pass it on now. Please do not attempt anything like this unless you feel Completely competent about messing about under your Beeb's lid – no tears if you screw up, please.

First, switch off the Beeb – to be really


PROLOGUE: THERE HE STANDS, SILHOUETTED AGAINST A BARREN SKY OF DESTRUCTION...
ONE FIGURE. ONE MAN ONE WAR...
NO, IT'S NOT DAVE "RAMBO" REEDER, NOR MARK "DEAT
NOT EVEN CLIVE "BLOOD N' GUTS" GRACE - IT'S.....
HEY! WHAT KINDA PROLOGUE ISSIS?
OKAY! OKAY! I'LL TRY AGAIN!....

safe unplug it also. Take out the Replay ROM and count down the pins on the right hand side – taking the end with the small notch as the top. Pin number nine has two untouching wires attached to it – one soldered to the ROM, one soldered to the ROM holder. Desolder the wire attached to the holder and then solder in a small plastic switch in series using thin wire (telephone wire is ideal). Refit the ROM and you should now be able to effectively perform a hardware disabling when required.

Have I tried it? No, I'm all fingers and thumbs. I prefer to ask programmers nicely if they can make me a special copy of the game that doesn't search for Replay – sometimes they do, as well.

Elixir Solved

Now that the *Elixir* competition is finally over, we can present an easy solution by Cthulhu. For this, imagine the 40 screens are coded A-H left to right and 1-5 from bottom to top – Cyril starts in 4C.

A useful point to remember – Cyril can stand quite close to pills without touching them, thus allowing you jump over green and yellow pills. On with the solution!

From the start (4C) get thread and pill, then left on middle shelf to 4B. Jump over pink pill to land on top of bottle then jump along bottles to get pill then, from left bottom shelf, fall right to 3B. Go right through 3C, avoiding flash-bulbs, to 3D to get pill, return to 3C and go to the left of shelf with bandage, jumping left to 3B. Get pill, right to 3C, get pill and antidote, up and left through 3B to 3A.

Climb down string and fall to left to get pin. Go left, get pill and down to 2A. Jump across gap using thread on hook and then down thread. Climb up and left for pill then fall right onto shelf in 2B. Work your way up to get pill, jump left back to 2A, then down to 1A, landing on bottle. Jump left for magic bean, climb up to 2A, up hanging thread and right, hop on top of green bottle, right through 2B to 2C.

Fall right to just above red pill, wait for correct moment, left and right to get pill and left to 1A, left again and down for pill then right through 1B to 1C. Avoid flash-bulbs, collect pill and move to leftmost item on bottom shelf into 1B, jump up string and back to 1C. Move right along middle shelf, then up and right to 1D. Avoid lipstick missiles, get pill, right to 1E, get pill then right to 1F.

Avoid flash-bulbs, climb string, get pill and bottle stopper, then right to 1G, jump along bottles to get pill, then left 1F and up to 2F, left to 2E, move along bunsen burner tubing to 2D. Jump onto tap to turn burner off, get pill, right to 2F, right and up, collecting pill and covering of oil, right to 2G, get pill, right to 2H and down to 1H.

Then right and back up to 2H, up and left to 2G, get chewing gum, right and down through 2H to 1H, get pill, left to 1F and up string to 2F. Up to top shelf, left to 2E, get pill, right to 2F, up string to 3F and, at bottom of string, jump right to 3G and get pills.

Back to 3F, up string (collecting pill from middle shelf) to 4F climbing string quickly to top, then fall left to place bottle stopper in position, get pill, then up and left to 4E. Drop magic bean into agar and then left to 4D, get pill, down and right through 4C and 4B to 4A, get pill then up and right, jumping on vanishing cream and toothbrush, to 4B and into 5B.

In the darkroom, avoid the Circularsaurus, go left on shelf into 5A, up and right to 5B, get pill, left to 5A, get pill, down, right and out of darkroom into 4B. Fall right and continue through 4C to land on small shelf in bottom righthand corner of 4D. Right to 4E, get pill, back to small shelf, fall right into 3E, burst balloon with pin, jump over gap in shelf, then fall left through it and get pill, left and down into 3F. Get magnet, back to 3E, down string to 2E, left to 2F, up string to 4F, left to 4E, climb to top of vine in 5E, get pill, left on middle shelf to 5D, get pill, right to 5F.

Get pill, left and down to 4E through 5E, right to 4F, down string, jump over pink pill to 4G, avoid flash-bulbs, get pill, climb string to 5G and stop leak with plaster. Down and right through 4G to 4H, get pill, go to bottom right shelf, fall left to 3h< down string, get pill, up string, left (jumping under magnet) to 3G, jump from left of shelf and climb string to 4F.

Left to 4E, up to 5E, ascend items on middle shelf to 5F, right along top shelf, fall to top of bottle, jump right to 5G, get pill, along top to 5H. Go right, get pill, down string until you've just washed oil off, then left and down to 5G.

Work your way back down through 4G to 3G, left to 3F, up to 4F, left to 4E, up to 5E, left along bottom shelf to 5D, jump from top of left bottle over gap into 5C. Climb up to middle shelf, right to 5D, up string, back to 5C. Get last pill. Drink Elixir! Phew!

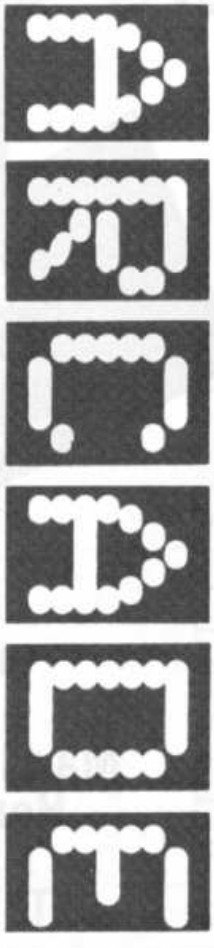
And Finally

And finally, we reach the end of this shorter than normal column. Hopefully, things should be wilder than ever next month after finally convincing "Groupie Editor" Mark Webb that we should do a Games Special. Final details are still being worked out, but you should see either very extensive cheats, pokes, maps and so on for a few games or lots of smaller items about a greater number of games.

Next Month? Well there seems to be an oasis in sight with some timely re-releases from Blue Ribbon – I'll also start looking at Electron releases pretty soon now thanks to the great Clive Grace clearance sale – hold tight, and all will be revealed next month!

By the time you read this, the decision to run the Games Special will have been made, but, remember, you can still write to me:

Dave Reeder, The Arcade, A&B Computing, ASP Ltd, 1 Golden Square, London W1R 3AB.



◆ LISTING 1 ◆

```
LIST
   10REM BBC PLAN B EDITOR
   20REM    By Optimus
   30REM For the A&B Arcade
   40REM       1988
   50MODE7:C%=0:FOR N%=1TO2
   60PRINTTAB(8,N%);CHR$141;"P
LAN B Game Editor"
   70NEXT:PRINT
   80FOR M%=&900 TO &950 STEP4
   90READ A%:!M%=A%:C%=C%+A%
  100NEXT
  110IFC%<>&D31320CB PRINT"Err
or!":END
  120READ C$,P$:P=EVAL("&"+P$)
  130PRINT C$;" (Y/N)";TAB(25)
;" : ";
  140G=GET AND 223
  150IFG=89 PRINT"YES":GOTO180

  160IFG<>78 GOTO140
  170PRINT"NO":?P=&60
  180IFP<>&941 GOTO120
  190PRINT'"Loading PLAN B..."
  200CALL &909
  210:
  220DATA &2903CAAD,&3CA8DFE
  230DATA &8D00A960,&9A90220
  240DATA &A902218D,&2004A20E
  250DATA &4CA2FFF4,&F72009A0
  260DATA &20A5A9FF,&36200932
  270DATA &093A2009,&4C094120
  280DATA &748D4CB3,&828D603F
  290DATA &238D603F,&3F688D3F
  300DATA &8D30A960,&B5A94B2D
  310DATA &604B2F8D,&4C502E4C
  320DATA &0D424E41
  330DATA"Infinite energy",932
  340DATA"Iniinite ammo",936
  350DATA"All parts destroyed"
,93A
  360DATA"No keys needed",941
```

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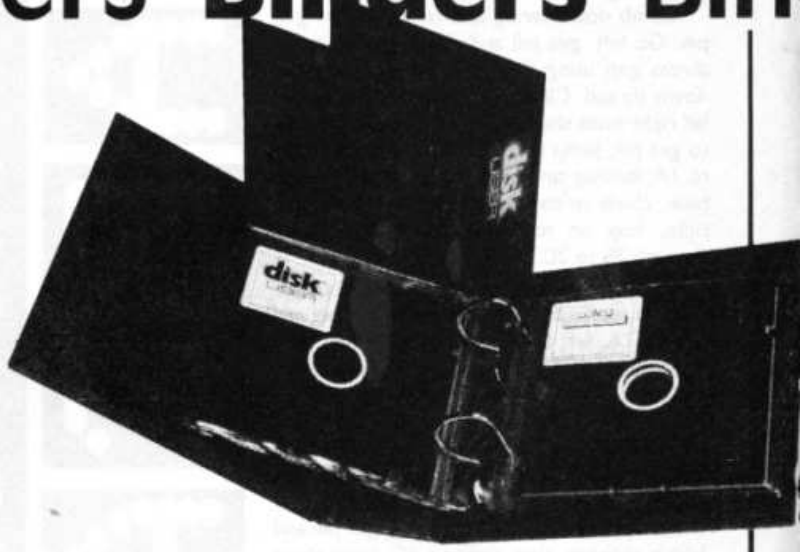

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ELECTRON COMPUTING

Codename Droid

(Stryker's Run Part II) Superior Software Electron Tape £9.95/£14.95 3.5"

Graphics/Sound 8 Playability 9 Originality 7 Lifespan 8 Overall 9

Excellent is the word that immediately springs to mind when describing *Codename Droid*. From the loading screen to the end of the game it is superb. In the graphics and playability departments it takes the Electron to new heights. But before I start to whet your appetites with details of stunning graphics let me tell you a little about the game scenario.

As John Stryker, commander in the Allied Nations you have a suicide mission. Your sworn enemies, the vicious Volgans have perfected the Z11 super spacefighter. The mission is to infiltrate the Volgan Base on their home planet. If by some miracle you achieve that, you then must steal the Z11 and fly it home. The base has tight security with Volgan soldiers patrolling in each of the three sectors in all the four zones.

The zones can be described as surface defence, ancient shrine, crew's quarters and missile factory. To move from sector to sector a lift is provided which only works when you have a passcard. Once the lift has been used the passcard is retained. As you might have already guessed this is a hybrid game: part shoot 'em up, part arcade adventure.

The programmers have found a good balance which makes the game both exciting and intriguing. Other objects can be found and used to solve problems. For example a piece of air conditioning pipe has fallen from its housing. The pipe blocks your way, nearby is a Herbert 7000 remote control repair droid. You don't have to be a genius to figure what you have to do next! Traps are scattered here and there and are pretty obvious so you won't find yourself dying just because you trod in the wrong place at the wrong time. Thought and effort is still required to overcome the traps and puzzles.

The playability of Codename Droid is similarly good. I managed to get quite far into the game before I lost all my lives which gave me a very strong incentive to try again. The game does get a lot harder as you move closer to completing the mission and so it should too! In order of importance after gameplay comes graphics. Here Codename Droid excels. The loading screen is the best I have ever seen on the Electron.

Anthony Edmondson should be congratulated for his artistic ability. The animation of John when he walks, runs, climbs, kneels and crawls commando style is very smart. The scenery graphics are detailed with colours being used effectively to produce some stunning screens. The backgrounds are even animated with such things as Gargoyles turning to face you as you move past them. The Volgan soldiers which you have to exterminate are also smoothly animated.

The only thing about Codename Droid I found a let down was the scrolling. It may be fast but it is not very smooth. This I know to be because of hardware limitations but maybe Martin Edmondson and Anthony Chamberlain can come up with a solution in the future. For the asking price Codename Droid is worth every penny due to the amount of effort put into to making this game a true piece of software entertainment. My final comment: *Buy this game now!*

Crazee Rider

Superior Software/Acornsoft Electron Tape £9.95/£14.95 3.5"

Graphics/Sound 8 Playability 7 Originality 5 Options Sound, Joystick, Exit game Lifespan 7 Overall 7

If you have visited an arcade recently you will have noticed that racing games are very popular at the moment. One game I enjoy playing is Hang On which gives a convincing feeling of riding on a winding track. It is great to see the Electron reproducing a similar effect. Riding and dodging bikes on a straight road would become quite boring after only a short length of time (just look at Overdrive for example!).

The object of the game is to win each race or at least come in one of the first six positions. Against you are 59 other riders, all of whom ride steadily but not at top speed. To win a race you must ride at breakneck speed and either dodge or dislodge your opponents. You get a reward for every rider you knock down but be warned they can crash into you and slow you down considerably.

If you veer too near to the edge of the track you will also slow down. The game is really exciting when you are just nearing the finish line and you need to overtake a few more bikes to qualify for the next race meet. The game features seven well known race tracks including our own Brands Hatch and Silverstone. The loading screen is quite funny and overall the game is a polished product with all the usual attention to detail that is thankfully becoming common in Electron games. The graphics work well in reproducing the effects of riding fast on a winding track. The other bikes zoom out of nowhere and demand fast reflexes to be avoided. If you like playing racing games then this one is well worth the asking price.

Palace Of Magic

Superior Software/Acornsoft Electron Tape £9.95/£11.95 5.25"/£14.95 3.5"

Graphics/Sound 7 Playability 6 Options Sound, Pause Lifespan 8 Overall 7

Citadel fans will breath a sigh of relief when they play this closely related arcade adventure. The plot is as follows: you play the part of a shrunken dwarf who wants to be restored to his former glory after having been transformed by an evil wizard. The name of the wizard is (wait for the anagram of the year) Caldeti.

You are by no choice of your own in Caldeti's Palace of Magic. The usual series of events follows. You wander around collecting keys to open doors and utilise magical objects. The grand scheme of things involves finding a hidden transporter that will take you home and restore you to your taller self. Along the way you will meet characters who may or may not help you in your quest. For owners of 5.25 inch disc drives with DFS, this game is available on your format at a very reasonable price.

Graphically the game is not quite as good as Citadel. This is due to the rooms being very similar in shape. No pyramids with invisible entrances here! The game does boast fast movement and little delay between each screen. There are very strong similarities between Citadel and Palace and that can only do Palace a lot of good. Playing the game could have been more exciting if it was possible to shoot the creatures that block your way instead of just dodging them. Apart from one or two letdowns this is a worthy successor and is a must for Arcventure fans.

Power Pack Vol. 2

Audiogenic Software Ltd Electron Tape £9.95

Overall 9

This compilation from ASL boasts a previously unreleased shoot 'em up game called Sara-

coid. It is fast, colourful and very hard. The speed at which the deceptively large aliens zip around the screen is frightening and your trusty ship can only fire a single bolt at a time! The graphics are large and clearly animated. The game play is frustratingly addictive but difficult. I play any shoot 'em up not only to clock up massive scores but also to see what weird and wonderful aliens are going to appear. There is a good range of different aliens and movement patterns to see and deal with.

No zapping fan will be disappointed with this pack as also included along with Saracoid is Psycastria. This is a horizontally scrolling shoot 'em up with reasonably smooth graphics. I found the controls to be a little unresponsive though and this marred an otherwise excellent game. Arcade adventurers have lots to do with this pack as there are two adventures. The first is Last of the Free and the second is Thunderstruck. Both have had extensive reviews in Electron Computing.

Stix is an original game in which you have to fill a square with colour. To do this you move a point away from the side into the middle of the square and, leaving a trail, you draw a smaller square. When it is completed it is filled with colour. This is repeated until nearly the whole square is filled. This may sound easy but to hinder you there are a couple of sparks which follow your lines trying electrocute you and also a stormy looking thing which floats around inside the square. If it touches you or your unfinished outline then you lose the game.

The remaining games on the pack are Froot Raid which is an entertaining fruit machine simulation with a bewildering array of features and Drain Mania. D.M. is a fun platform romp which includes some smooth graphics and addictive play. Power Pack 2 is in the last analysis worth every penny and is a great set of games to suit everybody's taste.

Electron Computing Hints 'n Tips

It's good to be back in the mag again. It seems the Archimedes is stealing the lime light for the moment but things will settle down eventually. In the last couple of months I have had lots of letters containing comments, questions and tips. Thanks to all who have written in.

Because of the lack of space in the column I cannot reply to all the letters and print all the tips. Do write in if you have a tip or hint which has not been published and we will see what goodies we can send if your letter is used. If you have any technical problems with hardware the person to write to is Clive Grace who is *omniscient* when it comes to the Electron and I am sure he can deal with such queries much better then I can. Let's get straight to the point and give you some help. The first batch of hints and tips comes from *Jason McCauley* of Runnymede Essex. He wrote:

To become nearly invincible at *Starship Command* enter the program below, which makes the energy recharge quicker!

P%=&5700 [OPT2:PHP:PHA LDA#24: STA&34B5 PLA:PLP:RTS:] ?&220=0:?&221=&57 *FX14,4

There's hidden music in *Frak!* and *Zalaga*. Enter

LOAD"FRAK!"

and when loaded GOTO 160

For Zalaga, enter

LOAD"ZALAGA"

when loaded GOTO 160.

To start at any stage in *Overdrive* and go on to the next event if you haven't reached the blue marker. First enter

LOAD"OVERDRIVE"

then delete lines with *FX200,2 or *FX200,0. *Don't load the next part.* Enter

LOAD"OVER2"

List the program and find the line that says IF ?BONUS>49 THEN ?STAGE=? etc. The 49 means the number of cars you have to pass in order to reach the next stage. Near the beginning of the program you should find: ?STAGE=1. If you want to start at SNOW change it to ?STAGE=3 (or the pyramids ?STAGE=4). Now save "OVER2" onto a blank tape. Turn the computer off and on. LOAD PARTS 1&2 then load the saved program. After that load part 4.

While you are playing *Deathstar* press <CAPS LK><FUNC> together with I and Q at the same time and the game will begin at the beginning of the level you are on. This is quite useful because it gives you more time to collect starbombs before the Deathstar is formed. When SIM has loaded press <BREAK> then enter *RUN SIM4. When this has loaded type

MODE 2

then enter

?&198B:CALL &1900.

Infinity

The next tip is from *Andrew Harkness* of Oakwood Cheshire. It is for infinite energy on the Electron version of Thunderstruck II.

a. *LOAD "MIND6" b. PAGE=&1B00 c. OLD d. Amend line 0 to read GOTO 101 e. Delete line 100 f. Add 'K%=212' to line 5 just before the RETURN statement at the end

ie 5MOVEK%,535:DRAWK%,543:K%=K%+(K%>32):O%=(K%=32):SOUND&13,3,K%,2:K%=212:RETURN

g. Save it back to tape with *SAVE "MIND6" 1B00 +A7F 1B00

He very kindly informed me that an 'Elk' is a type of moose not a computer. I have to agree with him and so will not be referring to the Acorn Electron as an Elk any more. *Paul Dobson* whose cheats I have already used has written in asking for a penpal. So if anyone wants to write (especially if they have an AP4 and 40T disc drive) here is his full address: 9 Lyvedon Way, Long Ashton, Bristol, BS18 9ND.

He also informs me that there is another Electron User Group whose address is:

Graham Thompson Applications Officer Electron User Group 29 Morrison Avenue Maltby Rotherham S. Yorkshire S66 7EY

John Fitzpatrick wrote in asking very kindly if I would mention a user group that he and some Electron owning friends are running. They provide a monthly magazine and details on various programming projects. For more details on how to join just write to:

J.P. Fitzpatrick 8 Sydney St Saltcoats Ayrshire Scotland

More cheats

Returning to the subject of cheats Paul has provided the passwords for the America file on *Around the world in 40 screens* by superior. They are: America – 52463 Curtain – 57036 Vampire – 2457 Created – 2566 Lunatic – 16961 Maximum – 15699 Compose – 56696 Colours – 10568

Moonraider - note: Plus 1 and AP4 users must disable the Plus 1. PA.=&B00 LO."GAME1" 32000?&1930=&FF:CALL&1900 RUN

Cybertron Mission

*LCYBERTRON ?&1A06=60 ?&1A16=level (1-4) CALL&4000

Boffin

*LBoffin2 ?&1393=&FF CALL &5C02

I was sent a letter from Sgt. *Roy Parsons* from RAF Chivenor N. Devon. He wrote:

Dear Matthew, I am writing to mention about your article in the September issue of A&B ref. Electron disc systems. You mention that the ADFS fails to work with the ACP4. I have found this to be partially true, it does not work in the interface, but owners of Rombox Plus units will find that the Plus 3 ADFS ROM placed in one of the Rombox's sockets will work without a problem. I purchased the Plus 3 ADFS ROM and utilities disc in order to be able to use both filing systems.

I am awaiting delivery of a second processor and do not envisage any problems with it and my present setup. My system so far is Rombox Plus, ACP4, 3.5 double sided disc drive. I also found that 3.5 inch discs formatted to ACP DFS give no problems. I hope this is of some interest, particularly with Elk owners wishing to use ADFS but like me do not have a Plus 3, must stress that it must be the Plus 3 ADFS and not the BBC ADFS ROM. Hope you

manage to do more articles for us Elk users.

Thanks for the letter Roy, when I tested the ACP4 I didn't think of trying the Plus 3 ADFS in an external ROM socket.

A number of people have spent a lot of time and effort drawing maps of games only for me to have to turn down using them because they are drawn in *pencil*. If you are going to or already have sent in a map or solution could you please make the map *large* and drawn in

black ink.

If you are providing a long solution or cheat listing then please supply the text and programs on cassette or disc. Solutions can be written in Wordwise or View. The hints and tips that are used will warrant a reward of some kind. So do send in your letters and maps to the usual address.

Everyone seems to complain about the brevity of Electron coverage. The reason is simply that the BBC Micro, Master and Archimedes also need to be covered. But we try hard to cater for everybody's needs. We've decided that we are going to have Electron specials every three months. The cover of the issue that contains the Electron Special will let you know when it is time to make sure you don't miss A&B. In the meantime many of our articles on programming and of course our listings are applicable to the Electron.

To make the Electron Special even better value we are looking for programs written specially for the Electron. Games, utilities and applications will all be considered. The programs can be sent on either cassette or disc (5.25" or 3.5") with full documentation eg listings and explanation of how to use the program and how it works. Payment is made at competitive rates for good quality software so send your latest masterpieces to:

Matthew Fifield Electron Computing (A&B) ASP Ltd Number 1 Golden Square London W1R 3AB

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Archimedes

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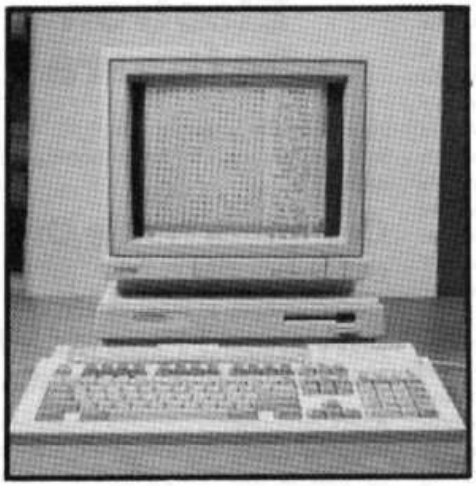

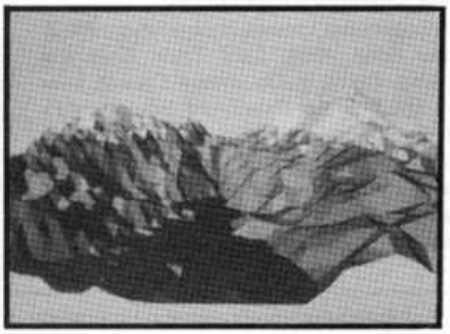

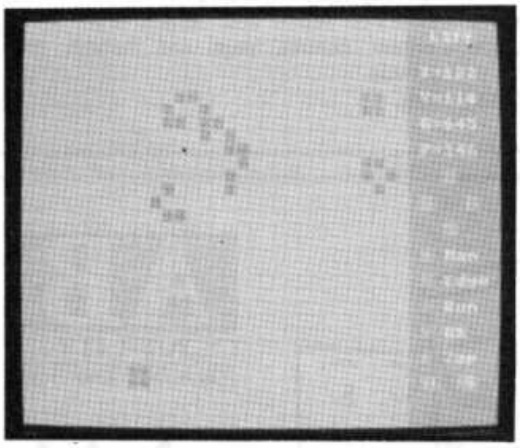

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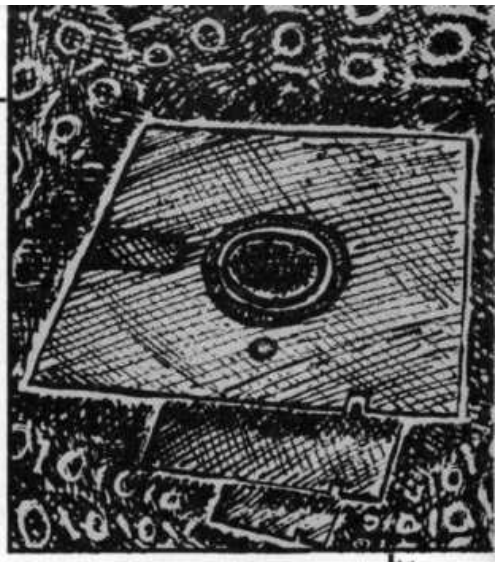


Jon Vogler

UNIX – ALMOST

Archimedes with emulator and hard disc, Master 512 and BBC with Torch Graduate are all capable of emulating Unix from DOS

Last month I wrote that it would be the end of this year before Acorn released UNIX running on the Archimedes. This month I'm going to tell you that I have already been running UNIX on an Archimedes 310 fitted with a hard disc. Lies? Time-travel? Been under the influence?

No, the miracle is achieved by a splendid software package called MKS Toolkit which runs under MSDOS in such a way as to convert it to an almost perfectly UNIX-like user interface. And as, using the emulator, you can run DOS on your Archimedes, this means that you can emulate your emulator and also run Toolkit to make your Archimedes behave like a UNIX engine, or very nearly.

Toolkit will also run on a Master 512 with MSDOS, but not on a Master 128. A hard disc and 256 k of memory are essential and more memory is an advantage.

Who will benefit?

I can envisage a number of different kinds of A&B reader who might benefit enormously from Toolkit:

1. The reader who knows very little about UNIX and would like to have a not-too-expensive play, to discover what it is all about.
2. The person who is thinking of buying UNIX for her Archimedes, as soon as it is released, but wants to try it out in practice before making a comparatively heavy financial commitment.
3. The reader who is using the DOS emulator quite extensively (either to run favourite DOS packages such as Lotus or DBase 3 or to handle DOS files produced, for example, at work) but who finds the DOS system restrictive and needs far more functionality. She may yearn for a better editor, the facility to search and manipulate text, the ability to manipulate files more fluidly and so on.
4. The educational establishment that wants to give students a taste of UNIX, perhaps as part of a computing course. Because IBM has been (far-sightedly) generous in distributing (some might say dumping) them among colleges of further education PCs are widely available but UNIX engines are not. Many also possess members of the A&B family (Archimedes, Master, BBC with Torch Graduate) that can run MSDOS.

Rather Slow

Users accustomed to UNIX on dedicated "engines" will notice that everything runs much more slowly, particularly where you use pipes. This is partly because DOS itself is inherently slow and partly because the DOS pipe facility is a makeshift which uses temporary files: instead of one command flowing into another, the first command sends its output into the file and the second command reads the file for input. Even pipeless commands run slightly slower than under raw DOS but for most users the convenience of the UNIX command structure will more than compensate for this.

For example, to do a DOS DIR on the /bin directory (which contains all the Toolkit executable files) took twelve seconds. To do a UNIX ls – l listing on the same directory took twenty-four seconds but of course this generates rather more data, for example the file permissions and the ownership. To do a simple UNIX ls listing of bare file names took only eight seconds. The figures are for the Archimedes emulator.

Installing Toolkit

Toolkit will not run under ADFS; you have to partition your hard disc, which means devoting ten megabytes to MSDOS. The process of "formatting" the DOS partition automatically loads MSDOS. Then you copy a single installation file to the hard disc and it prompts you to load each of four floppies in turn.

There are four installation options, depending on how completely the UNIX emulation is to take over. With the first you virtually remain in DOS and must consciously switch to UNIX. However to alternate between the two is exceptionally confusing and liable to lead to errors. To take the simplest example, MSDOS uses the forward-slash (/) and UNIX uses the back-slash (\) to separate the elements of file path-names. Totally different commands perform similar functions and the directory tree structure, and such processes as pipes, are remarkably similar.

The second and third options submerge you in UNIX to varying degrees and, with the fourth, you are magicked into full UNIX. It is easy to install the files but the full transition is complicated and poorly explained. The worst problem is that the instructions do not warn you to create a password file beforehand. I found that the system was automatically booting UNIX and, as there was no password file, it would not allow me to log in to make one! Ever wondered why MSDOS tries to boot from floppy before going to the hard disc? It saved my bacon!

Once safely password-approved I was in a new world, with the familiar A> prompt replaced by the UNIX hash #. I could create a "profile" in my home directory to set the search path (the list of directories through which the system automatically searches for any command you enter) and various environment variables. Among the most important are those that define which "shell" you use, which temporary directory (for programs that create temporary files which they destroy after use) and, for overseas readers, the TZ command which informs programs, that use times and dates, of the current time zone.

COLUMNS (to set the width of an output device) is special to Toolkit and does not occur in standard UNIX. Nor does ROOT DIR which specifies the root directory, essential because (like ADFS) DOS does not merge the filing systems of several devices, by mounting them, as UNIX does.

So, even if you have just one hard disc and a single floppy, you need to specify which one contains the main filing system and its root directory. You can still communicate with separate devices by prefixing them with the standard DOS drive indicators (a: or c:).

Likewise there are appropriate devices for printers and you can "redirect" output to them. There is a range of environments for the vi text editor: to determine how the screen is handled (such as auto-indent and margin for word-wrap), to map keys to any command sequence and to set abbreviations for favourite phrases.

Standard Commands

UNIX contains many small, separate programs which, when strung together provide a flexible and powerful set of tools, for file management, text processing, software development and many other tasks. Most worked just as they should; a few were unusual or missing. For example ls lists files down the screen but instead of ls7 to tabulate them I had to pipe the ls output through a column formatter c. Likewise mv moved files from one pathname to another but the UNIX ln command (stands for "link", a Siamese twin of mv and cp, allows the same file different names) was missing.

pg is only available with the latest issues of UNIX. It is an improved version of the well known more command (also available on DOS) which displays a text file one screen at a time (no need to fumble for the Control-S key) and has various facilities such as for skipping several screensfull or retaining the present position while transferring to the vi text editor. However more cannot move backwards whereas pg can: a very useful feature when scanning rapidly through a file to find some particular word.

Journeys around the file tree were effortless, with .. referring to the directory above the current one and cd (change directory), with no directory name specified, leading magically to the home directory. UNIX gives far better file tree information than DOS: ls -l discloses read, write and execute permissions, date of last modifications and size in bytes and du tells how much of the disc is being used by each directory. However Toolkit's df (free disc space) described only a specified disc, not, as in true UNIX, all "mounted" discs: a reminder that this is only an emulation.

I had expected Toolkit would funk complex command options but not at all. The example shown uses some of the eighteen options to the pr command which formats a text file for printing:

–o5 offsets the page 5 characters to the right
–2 gives 2-column output
–t suppresses headers
–p pauses after each page

Equally endowed with options is find which will trace files in the directory tree (important on a big hard disc). find's various options find files by:
name
how recently accessed
owner
file type
permissions
If you work for MI5 you could, for example, find all text files which are owned by the Secretary of State for Defence, accessible to a spy and have been accessed within the last twenty-four hours. It even searches for all files with a given number of links regardless that, under the DOS file structure, files have no links!

The Shell

Particularly pleasing were file manipulations by the shell: re-direction and piping worked well, albeit slowly and the powerful ability to run a command within back quotes (``) and use its output as argument to a quite different command, performed impeccably. For example, to count words in all text files you might try to list them, using a wild card, and pipe the results through wc (the word counter) thus:
ls *.txt wc -w
but all that will do is count words in the file names. What you need is:
wc -w `ls *.txt`
and it worked perfectly: not only files listed down the screen with the word-count beside it, but a neat total at the bottom: vital for authors paid per thousand words!

Toolkit manages shell variables, parameter substitution and such programming constructs as if-then-else. case and do-

UNIX – A SUMMARY

Multi-User and Secure

Separate terminals can connect to a single UNIX computer. Users log in (enter their name and a password, not echoed to the screen to prevent peeking) and are placed in their personal "home" directory. This becomes the root of their private file system in which they can create sub-directories and files but cannot, without special privileges, enter anyone else's unless they are members of the same "group". A file's owner decides who may read, alter or execute it: either herself, members of her group or the public at large.

The user is given a shell with which to issue commands. For learners, a restricted shell is available which will not allow them to damage the system or other files. For full users the shell is both a programming language and a gateway to many other facilities.

Tools, including "shell scripts" written by users, can be kept in separate directories to ease management and a "search path" tells the system where to look for them. To keep files safe they can be encrypted using techniques based on the German wartime ENIGMA System.

Everything is a File

UNIX treats everything (a directory, an error message, a modem or even another computer) as a file. If you execute a shell command UNIX automatically creates three files: standard input (normally your keyboard), standard output (normally the screen) and one for error messages. On windowing terminals several standard outputs can occupy separate windows with different programs apparently running simultaneously. In fact they are each being granted alternate time slices; on a slow system you can see that they move by jerks.

Without a windowing system lengthy processes can run "in the background" or can be started, automatically, at dead of night.

You may redirect a command to take input from a disc or from another file, send output to a modem or errors to a printer. Alternatively the output from one command can be "piped" into the input of another and pipes can be connected end-to-end. To tap into a point half-way along the pipe you (keeping plumber's jargon) insert a tee which sends output to the screen without interrupting the pipe. Pipes can become lengthy so commands use short names like cp for copy and ls for list, with single character options such as ls -l which displays a long directory listing.

Text Processing

Although it has substantial numerical powers, UNIX is renowned as a writers' tool. There are all the components of a powerful word-processor, kept, typically, separate. There is a variety of editors:

- ed deals with a line at a time but is almost instantaneous to enter and leave.
- A stream editor, sed, edits files that are streamed through it, according to commands from the keyboard or a separate file. Useful for very long files or many to edit in the same way.
- The full screen editor vi is powerful and sophisticated.

The text formatters intersperse text with dot commands (like WordStar but far more powerful). They can produce output for a photo-typesetter as well as a printer, to a standard adequate for professional publications, such as books, as well as technical reports. They are not easy to use without much study but, in the hands of an experienced user they can automatically generate indexes, contents lists, variable headers and footers and footnotes. Pre-processors enable inclusion of tables, scientific formulae, graphs and line diagrams within the text of a report.

Finally, a battery of text manipulation tools will find words in files, sort lines by order, swap columns in a table and format files for printing with any line or page length, columns or margins.

►►►

while. We have an example which shows the for looping through each filename specified by a wild-card, to apply a series of processes. The output from ls -l comes in seven fields, of which the third is the file-size and the seventh the name. It has been piped through awk (a programmable data formatter) to produce a legible report containing those fields.

Repeating Previous Commands

One of the weakest features of MSDOS is that, if you issue a command incorrectly, there are limited facilities for repeating and editing it. Indeed, if other commands have intervened, there is no alternative to retyping it. Loyal BBC adherents love the arrow keys, which detach the graphics cursor from the text cursor to point to any text on the screen, which can then be copied by use of the COPY key. However if the command to be copied has scrolled off the top of the screen they are lost.

Toolkit offers a wide range of alternatives. Its shell is an emulation of the UNIX KORN shell, which is becoming extremely popular and has a command line editing facility. In its Toolkit version either you can emulate a text editor for command line editing, either vi or emacs, whichever you prefer. Or you can use:

- the full range of along-the-line editing commands to alter the current command line,
- the vertical editing commands (up and down the page as it were) scroll backwards and forwards through the command history queue.

Thus by typing

set – o vi

you can invoke the vi command line editor. Type half a dozen words on the command line, then press the escape key, and you can edit by using w and b to move a word in either direction, h and l to move by one character, 0 and $ to move to front and back of the line and so on. To bring the previous command onto the command line you would type k, then, to bring the current one back again, j and you can prefix these with numerical arguments: to go five commands back type 5k.

You can also search and replace for patterns. This is a most useful facility (not provided by the Warwick shell) as the main thing you can remember about a previous command is not its number (how many commands you have issued since) but what it contained. Similar facilities exist using the emacs editing option.

Alternatively there is a straightforward history mechanism, using fc (fix commands) with syntax equivalent to the ed line editor. You can list a command history on the screen and display, edit or re-execute any of the commands in the list.

vi Text Editor

Inexperienced users loath vi; gurus love it. Using mainly single keystroke commands you can edit a file far more rapidly than with conventional wordprocessors. Toolkit's version is excellent. For illustration consider the $ (dollar) sign. It achieved all its functions:

- In typing mode to insert a dollar sign.
- In command mode it moves the cursor to the end of the current line.
- With a "count" (a number before it) it will find the end of the line that number ahead.
- In search mode it represents the end of the line or:
- also indicates the bottom of the text.

Wordprocessor power depends on how many commands can result from a single keyboard, so a program that extracts five from a single character rates highly. Even vi's sophisticated functions worked: mapping keystrokes, setting abbreviations and tagging files (a useful aid to programrs who can return magically to the "tagged" point in each of half-a-dozen subroutines).

Missing UNIX Functions

Some features are simply too much for a DOS system and are omitted:

- The text formatters nroff and troff and their macros and pre-processors.
- System facilities such as the UNIX-to-UNIX communication system, and the spooler (that handles several printers from one computer and several computers into a single printer)
- The C program development software.
- and, of course, communications and networking programs.

Documentation and Help

There is context-sensitive help: help followed by the command yields a single-screen message; usually relevant. Sometimes it gave:

"There is no help listed for this command"

which would be disappointing for a perplexed novice. There is also a short screen tutorial for vi.

Traditionally UNIX handbooks have been unfriendly: informative but terse and complex. Toolkit handbook is better; contains most of the standard features but is less cryptic. It has a full permuted index (includes keywords, as well as individual commands) and a useful seventy-page tutorial.

I had two criticisms: the inadequate installation notes, as explained above, and the absence of a DOS-to-UNIX conversion card for users mazed by the sudden transformation.

Assessment

I thought Toolkit was superb value for money and a brilliant piece of programming. As a regular UNIX user, who feels cramped and uncomfortable when working in DOS, I found I could work freely and fluidly in Toolkit with the only indication that this was not pure UNIX being the rather slow response to commands that handled plenty of data. I was particularly impressed by the faithful replication of the full functionality of some of UNIX's best programs such as the vi screen editor, the awk database manipulator, the grep programs for finding words in text files and so on.

Indeed Toolkit is so advanced that it had some features not available on my Torch Triple X UNIX implementation (although they are included on my new Quad X) such as the pg command. I have used UNIX for three years so am at home with it.

To revert to DOS is now tedious; with many repetitious actions, like cutting the lawn with shears after using a power-mower.

Toolkit released these frustrations; I could again sit at a PC keyboard and manipulate files effortlessly. It is an investment in productivity for any PC user with a spare megabyte on a hard disc and the willingness to lie in the bath and soak up new commands.

My only caveat about Toolkit is that the handbook, which is excellently detailed and thorough and most informative, is a little bit on the difficult side for users who are unfamiliar with both UNIX and DOS and they may certainly need help in getting the system installed and correctly implemented. However the tutorial at the end of the handbook is extremely helpful. Toolkit is reasonably priced considering the huge size of the package (it comes on no less than four floppies) and I thoroughly recommend it to all readers in the categories outlined at the start of this article.

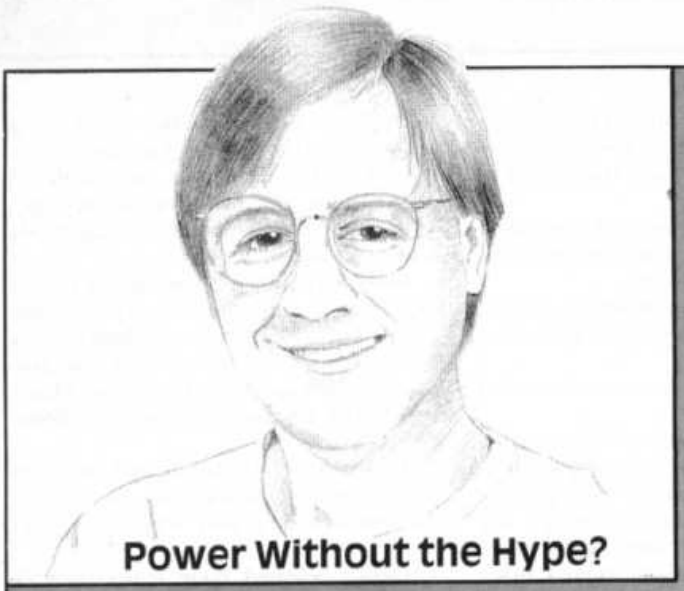
A word of warning however. There is no going back! Not because you cannot remove the Toolkit files; they are tidily grouped in two distinct directories. The reason is that, once you have tasted the power of UNIX, you will never go back to pedestrian MSDOS or even, I predict, to ADFS. You will be utterly discontented until Acorn have placed the full power of a UNIX Archimedes on your desk. You have been warned!

Factfile

MKS Toolkit is written by Mortice Kern Systems Inc of Canada and is distributed in Britain at a price of £139 by Systems Marketing Ltd, who kindly provided the copy for review. They are at 8-10 West Mills, Newbury, Berks, RG14 5HJ, (Tel 0635-36111). However I have also been informed by Computer Technology Group of Bush House, 72 Prince Street, Bristol BS1 4HU (0272-290651) that they are offering it at £99.00 + VAT.

Note

To assist the reader, DOS commands have been given in capital letters, UNIX (and Toolkit UNIX-emulating) commands in lower case letters. UNIX shell variables are (in accordance with custom) written in upper case letters.



Power Without the Hype?

"Last month I went to a special preview of the new Atari ABAQ transputer system at the Cafe Royal. Not only was it an excuse for us hacks to meet the faces behind a seemingly faceless company, but it was also a chance to hear Atari bleat on and on about "the next five years" and listen to hour upon hour of PR men with smiles larger than their suits talk about how Atari have found "yet another unique (?) niche in the marketplace, and how they see the state of the computer industry".

After the main presentations I was quite literally accosted by a gentleman "claiming" he was from Database Publications. This lackey (who shall remain nameless only because he was not wearing his press badge) took one look at *my* press badge and greeted me on first name terms as if we had been lifelong buddies.

He was quite clearly excited about something or other, and after disposing with the usual social pleasantries, he started spouting Atari's own PR blurb *back at me!* His broken sentences were liberally interspersed with such juicy *non-sequiturs* as: "This technology is the way ahead", pointing in the direction of the ABAQ rooms, and "Power, such power, have you seen what it can do!" (I overheard an Atari man telling a group of hacks a similar sentence.)

But the best bit was when he prophetically spluttered "We will all be record producers in the future!", again in broken English, and again with the same wild gesticulations of a man working himself up to a worrying form of nervous disorder.

Record producers? that's right folks, you read it correctly! It is in his "expert" opinion that in five years time, machines will have graphics that will "look so realistic that they will effectively simulate people", that will "sound better than a compact disc" (which isn't difficult), and that will have "processing power that will leave the Archimedes standing".

Journalist or not, this guy was beginning to annoy me, so leaving my professional impartiality behind I replied; "Transputers and RISC chips will not change a damn thing unless we really *need* (not *want*) this sort of processing power, after all, why have half the world opted for PC clones?" – the kludged, inelegant and slow bastard child of the mainframe industry?

Clearly this gentleman didn't hear me as his eyes glazed over. His mouth twisted into a grin and spoke, (more to himself than us), "Ahh, but RISC technology is here and now, Transputers are the way ahead". (This wasn't an answer, by the way.)

I must admit, I get very worried about the state of the industry when magazine people – especially editors – consume all the advertising spiel they can, and spew it out lock stock and barrel. Editors are here to collate and disseminate this information and relate it to **you**, dear reader, making sure the truth is printed wherever possible. And that means anything short of a government order being slapped on an article (remember the "Zircon" documentary?).

To a journalist, telling the truth is the prime directive, not currying favours from other journalists, **not** pandering to potential adverisers, but telling a story as it reaches the journalist *if* he feels that the telling is truthful.

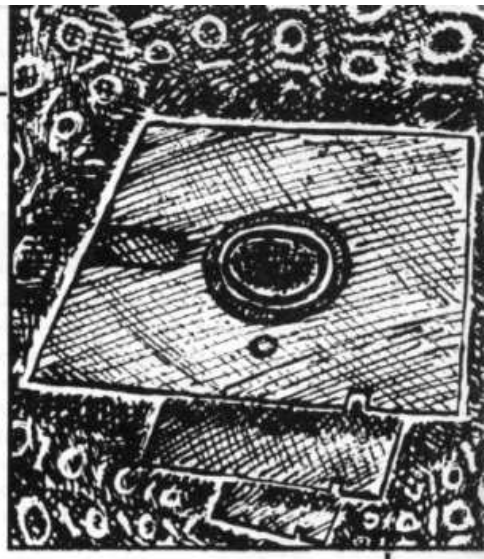
I seriously doubt whether this gentleman in question had any conception of the "truth" at that particular moment in time, so gorged was he on Atari's admittedly seductive advertising.

What is the truth? The truth is *not* making wild assumptions, it is *not* retelling these assumptions in any way shape or form that suggests it is the truth, and it is *not* running about like a hyperactive child grabbing all the games and press sheets you can, and getting excited about something as inane as "computer equipment".

It may not seem fair, but journalists have to look at a story and, wherever possible, use their professional judgement to ensure that what they are looking at or hearing, *is* the truth. This involves taking a step back. Sometimes this is misinterpreted as aloofness, sometimes it is seen as possessing sagely knowledge (or an equal amount of pretension). It is neither, because journalists have to see the *truth* in a story before they tell the public – otherwise we may as well take reviews from PR companies instead of selecting reviewers or writing ourselves. PR companies supplying the copy (text) about the products they are supporting is happening all the time in American journalism (it is called "advertorial") and it is a trend that is sadly beginning to creep over into some of the UK's "controlled circulation" business magazines.

The computer journalism industry (and I believe it is an industry) is still very young in comparison to other aspects of the specialist press (such as HiFi, fishing, motor car magazines and so on...) and, as a result it is still struggling to be accepted as a serious medium through which you can obtain your specialist information. Yes there is space for humour in *all* magazines, otherwise the proverbial "stepping back" I spoke of earlier can be interpreted as a form of pretence. But my experiences at the ABAQ preview, proved to me that we have still got a long way to go if we want to be considered as serious journalists.

My final comment to "the gentleman from Database Publications" is that perhaps he had better dream of his imaginary computer system and become a "record producer" – anything other than being a journalist. Relating information is serious business, rewriting press releases and quoting companies wholeseale, without cutting through the advertising bull is not only unacceptable, unprofessional and deplorable but it is also tantamount to lying to your readership, which consists of readers like you. And me. "



Paul Fellows

Using the Arthur Operating System from ARM Assembler

PROGRAMMING THE ARM

The Arthur Operating Sytem for the Archimedes contains a wealth of facilities. Many of these are supported through specific "star commands" as was the case on the BBC Micro. However, compatibility is only skin deep because if we look below the surface the mechanisms involved are very different.

OS calls on the BBC Micro

On the BBC Micro the operating system is present in ROM and called up through documented entry points at fixed addresses in the very top of the 64K address space. For example to print a character on the screen you would load a register with the character and make a subroutine call to the operating system entry point.

```
LDA #ASC"*" JSR &FFEE \\ OSWRCH
```

This mechanism works very well but it presents a problem. The addresses chosen for the entry points are fixed forever once they are documented and in use by applications. This can make it very hard to provide compatibility with future systems, particulary when you change to a machine with a much larger memory map.

Of course with a machine with a different CPU you wouldn't expect assembly language programs to work anyway but it would be nice if BASIC programs with the odd CALL or USR embedded within them could be used. For example

```
10 A%=138
20 X%=0
30 Y%=65
40 CALL &FFF4
```

On a BBC Micro, this program calls the OSbyte routine in the operating system to insert a character into the keyboard buffer as if it had been typed. If you run this program on the Archimedes you will find that it still works! This is because BASIC V has a list of 'legal' 6502 entry points and checks every CALL or USR to see if the address being called is one of them. If it is then BASIC translates the call to the new system. The problem is that these addresses now lie in user-memory because the very large address space and increased amount of RAM has meant that the ROM is at &03800000 upwards. This means that if you assemble some code and then try to CALL it you may be unlucky and hit one of these special addresses. If this occurs the 6502 routine will be called in preference to your own code.

Clearly this situation is not very good. What is really needed is a mechanism which does not put constraints on the memory map of the machine.

Software Interrupts (SWIs)

The ARM provides an instruction specifically designed to do this job. It is known as the SoftWare Interrupt or SWI instruction. When the ARM executes a SWI instruction it goes off into the operating system which then performs some calculation or service and then returns control to the original program.

Like all other ARM instructions SWI is 32 bits long. However, only 8 of these bits are needed to specify the instruction, 4 to say that it is a SWI as opposed to any other sort and 4 to specify the conditions under which it should be used. This leaves 24 bits to play with. These bits are used to specify which operating system routine is to be called, giving a total of 2 ↑ 24 = 16 Million possibilities. The operating system provides only a tiny fraction of this number, many groups of numbers are reserved for extra modules or application programs. Note the values used have no particular relevance other than that they reflect the order in which the SWIs were specified and implemented.

Printing out a string

The following example shows how one of the simplest SWI calls can be made to output a string of text to the screen. The string is placed in-line after the SWI instruction and characters from it are sent to the screen one at a time until the value &00 is found which marks the end of the string. The operating system then returns to the program at the instruction immediately following the end of the string.

```
10 DIM code% 1000
20 P%=code%
30 [
40 SWI 1
50 EQUS "Hello world"
60 EQUB 0
70 ALIGN
80 MOV PC,R14
90 ]
100 CALL code%
```

SWI 1 calls the routine in the operating system to write out a string. With so many possible SWI calls it was obvious that it would be very hard to remember what they all do, so a system was produced which allows them to be specified by name rather than by number. The name given to SWI 1 is "OS−WriteS". All the calls provided by the operating system have the "OS−" prefix, the

rest of the name is hopefully much more descriptive. To see this in operation change line 40 to read as follows

```
40 SWI "OS_WriteS"
```

When you RUN the program BASIC does the conversion from string to number (via another call to the operating system). The example programs at the end of this article shows how this trick is carried out. One thing which prevents the names from being as easy to remember as they might be is that the system is particular about upper and lower case letters so you need to be careful when typing the SWI names in.

Passing parameters in registers

For all but the simplest SWI calls additional information is provided to the operating system in registers.
For example

```
10 DIM code% 1000
20 FOR pass%=0TO3 STEP 3
30 P%=code%
40 [OPTpass%
50 ADR R0,string
60 MOV R1,#11
70 .loop
80 SWI "OS_WriteN"
90 ADD R0,R0,#1
100 SUBS R1,R1,#1
105 SWINE "OS_NewLine"
110 BNE loop
120 MOV PC,R14
130 .string
140 EQUS "Hello world"
150 ]
160 NEXT
170 CALLcode%
```

This example shows another, more flexible, way of printing out a string. The first SWI call – 'OS_WriteN' – is used to print out a string of characters which start at the address held in R0. The other parameter to this call is R1 which holds the number of characters to print, i.e. the length of the string. Initially this is set to 11 so that the whole of the string "Hello world" is printed. After the string has been printed R0 is increased and R1 decreased. Then, if the count in R1 has not reached zero, the program prints a newline (using the SWI provided) and loops round again. The result is that each time around the loop a shorter string (i.e. with one extra letter missing from the front of it) is printed out.

Getting Results back

So far, all these SWIs have left the registers unchanged. The next example shows a SWI call which leaves some results in registers.

```
10 DIM code% 1000
20 FOR pass%=0TO3 STEP 3
30 P%=code%
40 [OPTpass%
50 SWI "OS_GetEnv"
60 MOV R0,R1
70 MOV PC,R14
80 ]
90 NEXT
100 PRINT USR(code%)
```

This program will prints out the address of the top of memory as returned in R1 by the OS_GetEnv call.

Calling the OS directly from BASIC

Many of BASICs keywords translate into simple SWI calls and BASIC V has several extra keywords which provide access to the new features of the operating system. However, there are a large number of SWI calls for which there is no BASIC equivalent. To save you the trouble of having to resort to assembler to access them, BASIC provides a new keyword, SYS, which will do the job for you.
For example:

```
SYS "OS_Exit"
```

This will drop you out of BASIC into the Arthur prompt. It is the same as typing QUIT. To get back to BASIC type *BASIC.

Passing registers to SYS

It is possible to specify the values which will be put in the registers when the SWI call is made. This is done by following the SWI name (or number if you prefer!) with a list of values. The first of these is put into R0, the second into R1 and so on up to a maximum of eight. For example

```
SYS "OS_WriteC",7
```

This is the equivalent of VDU 7 from BASIC. Any registers which are not specified are set to zero.

Getting results back using SYS

Many SWI calls, rather than just providing a service, actually return useful information back via the registers. Therefore, BASIC programs need to a method of getting their hands on these results. This can be achieved through the use of the keyword TO followed by a list of variables. For example

```
SYS "OS_Byte",A,B,C TO D,E,F
```

assigns to the variables D,E and F the values which were in R0,R1 and R2 after the SWI call.

Using strings with SYS

Another nice touch makes passing strings very simple. Rather than having to set up a block in memory using DIM, copying the string into it and then passing the address of the block it is possible to simply specify strings as arguments to SYS.

```
SYS "OS_WriteN","HELLO",5
```

What happens is that BASIC notices that is has got a string so it finds the address of the string and puts that into the register automatically. A simliar thing also happens when results are returned. If the variable given is a string then BASIC will take the value in the corresponding register as the address of the start of the string in memory.

```
SYS "OS_GetEnv" TO
Command$ PRINT Command$
```

This call returns in R0 a pointer to the command string. BASIC copies this string into the variable Command$.

Names and Numbers

One particularly interesting SWI is the one provided for obtaining the 24-bit SWI number code corresponding to a named SWI. This is used by BASIC as described above. The following program shows how it in action

```
10 REM > NamestoNum
20 INPUT "Name",N$
30 SYS "OS_SWINumberFromString",0,N$ TO
   Number%
40 PRINT N$" is SWI ";Number%
```

The reverse process can also be carried out, to get a name from a number.

The Listswis program

The following utility program runs through possible SWI-numbers and asks the operating system to reveal the name for each one. This can be very useful if you forget what a particular SWI is called.

```
10 DIM code% 1000
15 limit%=256
20 FOR pass%=0 TO 3 STEP 3
30 P%=code%
40 [OPTpass%
50 .listswis
60 MOV R3,#0
70 .loop
80 ADR R1,buffer
90 MOV R2,#255
100 MOV R0,R3
110 SWI "OS_SWINumberToString"
120 ADR R0,buffer
130 SWI "OS_Write0"
140 SWI "OS_NewLine"
150 CMP R3,#limit%
160 ADD R3,R3,#1
170 BNE loop
180 MOV PC,R14
190
200 .buffer
210 EQUS STRING$(255," ")
220 EQUB 0
230 ALIGN
240
250 ]
260 NEXT
270 CALL listswis
```

In this example, R3 is the number of the SWI which we are interested in and is increased each time round the loop. OS_SWINumber TOString looks at the SWI number in R0 and outputs the corresponding name into the buffer pointed to by R1 (R2 being the length of the buffer). Lines 120-140 point R0 at the buffer and print out the name from it followed by a carriage return & linefeed.

The limit of 256 could easily be changed to look for SWIs with higher values – there are many of them. The only problem might be if you choose a limit which cannot be represented as an immediate constant on line 150. If you stick to numbers which are a power of two you will be OK.

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A) A.M. Turing.
B) Mark Cox and Granny Smith the mixed doubles partners and co inventors of the Apple computer.
C) Sir Irving Banana – inventor of the Apricot.
D) The Meccano Brothers.
E) Alan Sugar.

2. PROGRESS
In 1960 the space needed to house a computer with the power of the Archimedes would have been equivalent to:
A) A Ford Granada Ghia with sunroof.
B) Battersea Power Station.
C) A matchbox.
D) A small suburban bungalow.
E) A slightly larger bungalow with an extension.

3. SOFTWARE
The biggest selling piece of software since the beginning of time is:
A) Gauntlet.
B) Jet Set Willy.
C) Football Manager.
D) Breakout.
E) Mrs Jenny Butterworth's do-it-yourself crocheted place-mat program.

4. STORAGE
Which is the least likely computer storage medium of the future?
A) Eight track stereo cartridges.
B) Jelly mould cassettes.
C) Wax phonographic cylinders.
D) 78 rpm records.
E) Compact discs.

5. ACRONYMS
Of the following five computer acronyms only two are real. Which are they?
A) JOHNIAC – John Von Neumann's Integrator and Automatic Computer.
B) JOVIAL – Jule's Own Version of the International Algebraic Language.
C) ADMIT – Assisted Dynamic Memory Interchange Transmitor.
D) TUSC – Totally Unassisted System Crash.
E) BAG – Boring Acronym Generator.

6. ACCIDENTS
The most common cause of damage to computers is:
A) Power surges.
B) Static electricity.
C) Crumbs from McVities Digestive biscuits.
D) Meteor showers.
E) Coffee spillage.

7. COMMUNICATIONS
The most frequent message passing through electronic mail channels is;
A) "Do you want to buy my modem?"
B) "I haven't had a message for three years."
C) "The cheque's in the post."
D) "Can anyone direct me back to the multi-user dungeon?"
E) "Hello Phillip. How's it going? How's the wife?"

8. CONVERSIONS
Which of the following works is currently being converted into an arcade game by a leading software house?
A) The Koran.
B) War and Peace.
C) The Collected BBC Computer Manuals (unabridged).
D) The London Telephone Directory L-R.
E) The Hitler Diaries.

So how did you do? Have you qualified for the Abacus Diploma? Send in your entries and they will be judged along with your computing performance over the past few months to produce our list of Diploma winners for 1988. Don't worry if you think the continuous assessment section will let you down and don't fret if you haven't been able to answer a single exam question. At the Abacus Academy we try to instill optimism, so just remember to include your exam fee of £10,000 and relax.

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Just look at Codemasters!

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Once a program has left the programmers they have to get past the software evaluation division. On the right is Senior Consultant William who is eight, his two juniors, John and Annie (both aged Four) are fairly new to the biz but are showing promise. Who knows another couple of years and they'll all be able to join Micro User.

Music Competition Winners

Yes, at last we can give you the Winners to the June Music Competition. As you would imagine with a competition of such magnitude we were flooded by entries however very few of you got all the answers right so here's where you went wrong...

MIDI Stands for Musical Instrument Digital Interface It was concieved 1982 by Roland, Yamaha and Sequential Circuits. There was one Revision to MIDI. MIDI sockets are labelled IN, OUT and THRU. Alan Parsons Project used the UMI system, RSM grades go up to Eight and ADSR stands for Attack, Decay, Sustain, Release. Our source for these answers was Electronics Today International Magazine so any queries should be directed to them, not us.

Justin receives his Yamaha TX-81Z at A&B HQ. Darrin seems happy enough but what is Clive so interested in down there!

The Winners

Casio CZ-230s Peter Rees, Kent
Yamaha TX-81Z Justin Beard, London
Cheetah MK-5 Alan Crosby, Brighton
Roland MT-32 John Down, St Albans
UMI-4M To be announced

You may have noticed that the Yamaha prize has change since June when we offered an FB-01. Yamaha very kindly upgraded their prize when they saw the kind of response an A&B Competition generates. Likewise Cheetah Marketing have come up with an offer to all of you who didn't win the MK-5 which normally retails for £99.00. If you phone Cheetah and tell them that your an A&B reader you can get one of these for just £79.00. Can't be bad.

If you entered for the Music 2000 then stay tuned 'til next month when we will have ploughed our way through the mountain of disks we recieved.

The A&B Brothers sadly part with yet another prize (sob!) and boy, Peter sure has one hell of a Handshake as Darrin Discovers.

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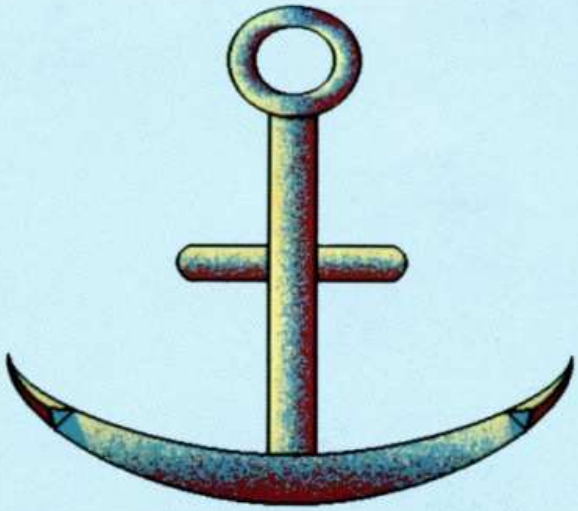

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pipeline

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The screen pictures show the BBC Micro version of the game.

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